Labor Migration, Capital Accumulation, and the Structure of Rural Labor Markets*

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Abstract

Can migrant capital contribute to structural change in labor markets of sending communities? We address this question by studying how rural labor markets in Malawi changed in the three decades following exogenous shocks to labor migration to the South African gold mines in the 1960s and 1970s. We assemble several waves of population census data and digitize archival data on remittances at sub-national level to track how employment patterns changed across districts receiving different amounts of migrant earnings. Districts receiving more migrant capital due to the time profile of migrant flows saw employment diversify away from agriculture and into the more capital-intensive non-farm service sector. These districts also accumulated more non-farm physical capital and human capital over the long run, and are wealthier fifteen years after the end of migration.

Keywords: structural change, migration, capital accumulation, Africa
JEL Codes: J21, J24, O15, O16, O47, O55

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1 Introduction

To date, no country has experienced significant income growth without shifting jobs out of agriculture and into the manufacturing or services sector. Researchers have documented large and somewhat puzzling productivity gaps between these sectors in developing countries (Gollin, 2002; Gollin, Lagakos and Waugh, 2014). Because the majority of workers in these countries are still farmers, there are potentially large economic gains to be realized from reallocating labor towards the higher productivity non-farm sectors (McMillan, Rodrik and Verduzco-Gallo, 2014). But what do workers in poor, rural areas need in order to shift their time out of low productivity farming and into more productive, diverse jobs in manufacturing and services? What factors facilitate a structural shift of employment away from agriculture?

Recent empirical evidence points to certain types of technology, trade, and environmental shocks being important triggers for structural change. For example, labor-saving agricultural technologies release workers from low productivity agriculture (Bustos, Caprettini and Ponticelli, 2016). Trade liberalizations reallocate workers towards higher productivity non-farm enterprises by changing relative prices of goods across sectors (McCaig and Pavcnik, 2014). And environmental shocks that alter the relative supply of factors of production and change relative prices of labor in farm and non-farm sectors stimulate labor reallocation (Hornbeck and Naidu, 2014). Largely missing from the literature is direct evidence on whether and how shocks to capital affect structural change. This represents an important gap in the literature, since capital accumulation is one of the key theoretical drivers of economic development and structural change.[1]

In this paper, we provide new empirical evidence that a temporary increase in the local supply of capital affects the structure of local labor markets in rural areas over the long run. We study how local labor markets in Malawi changed in the three decades after large, plausibly exogenous shocks to the option to undertake temporary international labor migration. In this historical context, labor migration is the trigger for capital accumulation that occurs outside the country, and returning migrants bring this capital home.

Specifically, we exploit spatial variation in the amount of migrant money received by districts within Malawi between 1967 and 1975. These years demarcate two historical events that first expanded and then shut down the ability of Malawian workers to take up jobs on gold mines in South Africa. The first event in 1967 entailed removing all mine recruiting quotas that had previously limited migration to low levels. The second was the banning of

[1] Classical development theories emphasize the role of capital accumulation in driving development, for example, Rosenstein-Rodan (1943); Lewis (1954); Kuznets (1955). Kraay and McKenzie (2014) review the ways that development economists have highlighted a lack of capital as a common mechanism underlying poverty traps.

migration and repatriation of all workers in response to a mineworker plane crash that killed returning miners in 1974.[2] In the intervening years, Malawi experienced a 200% increase in migration rates and received over 53 million USD in compulsory migrant remittances, the equivalent of 1.4% of GDP each year, or 8% of GDP in a single year.[3]

To analyze the effects of these shocks, we collected and digitized archival data on remittances and matched it with six waves of Malawian population census data. The resulting dataset allows us to track changes in the share of workers in different sectors and the diversity of occupations at the local labor market level over time, starting from the end of the migration episode and continuing for three decades.

To avoid confounding the impact of the return of capital with the effects of being a district that sends more migrants to South Africa, our identification strategy compares districts that sent the same total number of labor migrants to South Africa but received different amounts of migrant capital. Spatial differences in capital flows, conditional on total migrant flows are primarily driven by the time profile of district-level migration. That is, some districts sent more migrants in the late 1960s when mine wages were lower, while others sent more migrants in the early 1970s when mine wages were much higher due to changes in the gold mining industry in South Africa. We estimate differential trajectories of economic change in the decades following the migration ban by comparing places receiving more versus less capital, conditional on district and decade fixed effects and controlling for time trends interacted with total migrants sent and baseline district-level covariates. Importantly, we show that none of the baseline district-level covariates measured prior to 1967 predict how much migrant money each district received after 1967.

Our main finding is that after the end of migration, districts with larger capital injections see a greater share of workers shift out of agriculture and into capital-intensive, non-farm service activities. These shifts begin in the first ten years following the end of migration, once all migrants have returned, and continue into the second and third decades post-shock. Men shift out of farming first, with effects for women lagged by about a decade. Both women and men shift into the service sector, specifically into construction and retail sector jobs. More women also take up transport and communications work. Jobs in high capital inflow districts are more likely to be in family enterprises. Men in these new service sector jobs are more likely to be self-employed, while women are more likely to be family business workers.

[2]We discuss these events in more detail in Section 2 and in Dinkelman and Mariotti (2016).

[3]World Bank Databank: `https://www.google.com/publicdata/explore?ds=d5bncppjof8f9_&ctype=l&strail=false&bcs=d&nselm=h&met_y=ny_gdp_mktp_cd&scale_y=lin&ind_y=false&rdim=region&idim=country:MWI&ifdim=region&hl=en&dl=en&ind=false`. This amount is equivalent to 185 million USD in 2015, and was three times larger than total US aid received by Malawi in 1974 (Fagernas and Shurich, 2004).

These main findings are robust to a range of robustness checks, and do not seem to be driven by cross-district internal migration flows. Given the low-skilled nature of minework and the physical segregation of miners from the South African economy, it is also unlikely that miners acquiring more human capital or altering their aspirations while abroad drive the structural change results.

A second key set of findings relates to population density and urbanization. Urbanization is another aspect of structural change and, along with population density, is commonly used as a proxy for long run economic development (Acemoglu, Johnson and Robinson, 2002; DeLong and Schleifer, 1993). Our data allow us to track district-level population density and urbanization before, during and after the migration shocks. Measuring these outcomes prior to the shock also serves as a check on the identification strategy that produces the main results for employment. We show that districts receiving the largest capital injections from migration have slower population growth in the decades before the migration shock. These same districts then start to grow and urbanize faster after the migration shock. Population growth effects persist, growing larger, over time. The reallocation of employment out of agriculture and into services in the wake of migrant capital inflows is accompanied by a movement of population towards market towns and urban areas within a district.

We can use our estimates to quantify the overall impact of migrant capital on the structure of rural labor markets. For each additional one million USD received in the district through migration, approximately 1,400 workers shifted out of agriculture and into manufacturing or services (about 540 men and 860 women). Each non-farm job created by the end of the analysis period costs about USD713 in migrant capital. Between 1977 and 2008, aggregate employment in agriculture fell by 24 percentage points for women and 22 percentage points for men. A back-of-the-envelope calculation suggests that the inflow of migrant money accounted for between 5% (for men) and 17% (for women) of this total structural shift out of agriculture. While these shifts are not massive – Malawi is certainly no South Korea, or Vietnam – they do indicate a measure of structural change and, importantly, the persistence of labor migration impacts over the long run.

There are a few potential mechanisms through which injections of migrant capital could have had lasting effects on rural labor markets. First, the return of migrant money represents a positive shock to income. As long as preferences over food and non-food goods and services are non-homothetic, such a shock would raise the relative demand for labor in the non-food sector more than in the agricultural sector. However, to turn into longer run impacts on labor market outcomes, the income shock would need to ease a liquidity or credit constraint that would in turn allow households to continue to save and invest at higher rates. For example, extra income from migrant earnings could be invested in farm capital, raising the

productivity of farm workers and (in a closed economy) releasing excess labor to the non-farm sector.[4] Or, extra income could be invested in non-farm production, directly increasing the demand for workers in this sector. This could be especially important if there are fixed startup costs in this sector.[5] Households might also invest in human capital, raising the marginal productivity of labor in the next generation of workers and potentially shifting future patterns of employment.

Using additional data sources, we bring evidence to bear on some of these theoretical mechanisms for the persistence of the migrant capital shocks. We investigate how accumulation behaviors changed over time in high versus low capital inflow districts, measuring outcomes using population and agricultural census data matched with household income and expenditure surveys from before and after the migration shock. We find little evidence that districts receiving larger capital inflows invested differently in agricultural capital over the long run. There are no significant increases in rates of farm tool or livestock ownership. Instead, households in high capital shock districts invest more in physical non-farm capital: they are more likely to own radios immediately after the migration ban, and to invest in houses with higher quality walls and roofs, decades later. Households in these districts also invest more in their children's human capital.[6] And, in a final result, we show that fifteen years after the migration shock ended, districts that received more migrant capital are also significantly wealthier using an asset-based measure of wealth. Our evidence is consistent with capital accumulation from migration triggering a slow but steady expansion of the non-farm service sector by allowing sending communities to continue to invest in productive capital over the long run, and contributing to higher levels of wealth.

The primary contribution of our paper is to show that circular migration offers a route to capital accumulation that can in turn contribute to structural change in the labor market. Our work connects with theoretical and empirical strands of the development literature that model, measure, and test how credit constraints and financial frictions affect entry into and expansion of entrepreneurial non-farm self-employment.[7] We build on prior research

[4]Kinnan, Wang and Wang (2016) show that remittances from on-going migration can insure farm households and allow non-migrants to invest in higher risk/higher return crops. We do not study the insurance role of migrant earnings. In our setting, migrant capital flows stop at the end of the migration episode and so cannot play an insurance role during our period of analysis.

[5]The macroeconomic development literature has emphasized how credit constraints create barriers to the expansion of the entrepreneurial sector (Buera, Kaboski and Shin, 2013). Leight (2016) provides evidence from China suggesting that positive shocks to agricultural income enable workers to overcome credit constraints and fixed entry costs, and move into nonfarm sectors.

[6]This result echoes findings in our prior paper Dinkelman and Mariotti (2016). We use a different identification strategy in that paper, which we discuss below.

[7]On the theoretical side, see Banerjee and Newman (1993); Buera, Kaboski and Shin (2013). For empirical work on financial frictions and credit constraints, see for example, Burgess and Pande (2004); McKenzie and Woodruff (2006, 2008); Banerjee et al. (2015) among many others.

in the remittances and migration literature that shows how unexpected positive shocks to migrant earnings increase savings and investment in migrant households (Yang, 2008).[8] A key feature of our work is that we go beyond short and medium run effects on individual migrant households and estimate long run market-level effects of specific labor migration episodes and associated migrant money flows.

Our second contribution is to highlight the role that migration and associated migrant capital could play in Africa in particular, the region with perhaps the greatest potential for structural change. Malawi was only one of several southern African countries experiencing high levels and large fluctuations in mine migration to South Africa prior to 1990 (see Figure 1, and Lucas (1985, 1987)). Although mining employment on the continent has waned, high levels of South-South migration still prevail. To the best of our knowledge, the macroeconomic literature on structural change has not considered international migration as a potential source of local capital that could facilitate reallocation of labor across sectors.[9] Yet not only is migration an important feature of labor markets in low income countries, remittance flows to developing countries are three times as large as total foreign aid flows.[10] Against this backdrop, our results suggest that managed circular labor migration that channels earnings back to sending communities may present a practical tool for boosting structural change in communities where industrial, agricultural, and trade revolutions have been slow to arrive.[11]

Third, we bring to light new data to study important features of labor markets in a low-income country. Our analysis combines archival data, historical and recent population and agricultural census data, and demographic health and household income and expenditure survey data. We use highly disaggregated administrative data documenting remittance flows over time at the level of the sending community in Malawi. Such data are usually only available at the country-level, if at all. Combining these data with knowledge of the historical shocks generating quasi-experimental variation in migration and capital flows, we can address

[8]There is a long tradition of estimating the impact of migrant money coming back into migrant households. For example, Dustmann and Kirchkamp (2002) and Woodruff and Zeneto (2007). Yang (2008) is one of the few examples where an exogenous shock to migrant earnings is used to causally estimate the impacts on investments in business-related capital in migrant households. Recent work has focused more specifically on the effects of the end of migration flows on market-level outcomes (Theoharides, 2016; Kosack, 2015).

[9]At the micro level, Mesnard (2004) suggests that international labor migration can help individuals overcome liquidity constraints at home. Foster and Rosenzweig (2008) outline a model in which internal labor migration (rural to urban) and associated migrant remittances facilitate structural change in the rural labor market through local demand shocks.

[10]The World Bank notes that official global remittance flows to developing countries was USD 404 billion The World Bank (2014b). Total overseas development assistance in the same year was calculated to be USD 138 billion (OECD, 2015).

[11]Our results therefore complement the handful of papers that estimate the developmental impacts of seasonal and guest worker programs (e.g. Gibson, McKenzie and Rohorua (2014); Kosack (2015)).

numerous challenges that have plagued efforts to empirically test whether remittances affect market-level outcomes (Clemens and McKenzie, 2014). One specific challenge that our paper underscores is that unless there exist data to study how economies change over a long enough period of time, analyzing the impact of capital injections in the short run is unlikely to reveal large impacts on local labor markets.

We begin with a description of labor markets in Malawi and how these markets changed over time. To fix ideas about how capital might matter in rural economies, we discuss how farm and non-farm businesses use capital and labor inputs. We describe the source of the migration shocks in the 1960s and 1970s and where the spatial variation in capital inflows comes from, outline the channels through which these particular labor migration shocks may affect labor allocation across sectors, and set out our empirical strategy and data before discussing main results. We present evidence on how accumulation behaviors changed across communities over time and examine the wealth profiles of communities fifteen years after the end of migration. Finally, we discuss how our results can be interpreted in broader context.

2 Labor markets in Malawi

2.1 Declining importance of agriculture and a shift into services

In the 1960s, agriculture in Malawi accounted for half of GDP; by 2015, this contribution had shrunk to 30%. Manufacturing was around 13% of GDP in the 1960s, and 10% in 2015. Over the same period, the share of services in GDP increased from around 40% to almost 55% (The World Bank, 2016). Despite these shifts in production, most employment is still in agriculture, or connected to the agricultural sector.

Table 1 uses Census data from 1977 to 2008 to show how national employment rates in each sector of work have changed over time. Between 1977 and 2008, the share of economically active people in the agricultural sector fell from 94% for women (76% for men) to 70% (53% for men). Over the same period, the share working in services increased dramatically. In 1977, 2.8% of women and 12% of men were in service sector jobs and by 2008, these shares had risen to 21% for women, and 27% for men. We construct a Herfindahl index to describe how concentrated employment is in any one sector, for each district. Lower values of this index reflect lower concentrations, or more diversity of employment within the district. Over time, this index falls from 0.89 to 0.53 for women's employment, and from 0.61 to 0.35 for men's employment. This pattern of employment shifting from farm to non-farm sector, with non-farm jobs concentrated in services rather than manufacturing, strongly resembles patterns of structural change in other African labor markets over the last three decades, as

documented in Fox and Sohnesen (2012), Gollin, Jedwab and Vollrath (2016), and McMillan, Rodrik and Verduzco-Gallo (2014).[12] Our anlaysis links these patterns of structural change within Malawi to differences in migrant capital inflows into within the country.

To fix ideas about what non-farm work is, we look at the share of workers employed in each of the top five non-farm occupations and industries in Figures 2a (for women) and 2b (for men).[13] Retail trade tops the list of non-farm work: almost 40% of women and almost 30% of men work in the retail sector, with the next largest category being public schools and defense, and construction. Smaller shares of women work in the health and cleaning sectors, and around 2% of men make furniture, or clothing. Occupational patterns are similar. Almost 40% of women work as shop assistants, 15% are teachers, 7% are food and beverage producers (e.g. beer brewers), and 5% each work in the medical sector (nurses) and as clerks/stenographers. One in four men works as a shop assistant, 11% and 12% work as brickmakers or carpenters, or security guards, and 6 to 7% work as bus or taxi drivers, or teachers. Overwhelmingly, the non-farm sector is comprised of people working in small-scale personal and general services.

2.2 Relative capital intensities of farm and non-farm work

One stylized fact in the development literature is that production in the non-traded non-farm goods and services sector uses almost no capital, whereas farming uses more capital. This is the case in the well-studied ICRISAT villages in India, for example (Foster and Rosenzweig, 2008).

Table 2 illustrates that exactly the opposite is true in Malawi. We show how capital is used in farm and non-farm production using data from rural households interviewed in Malawi's 1997/8 Household Income and Expenditure Survey. All households in the sample are engaged in farming of some sort, producing some combination of food crops, cash crops, or livestock. One fifth of these households also own and operate at least one small business, many of them providing the type of employment described in Figures 2a and 2b. Most non-farm work is conducted in household enterprises, and operated by self-employed people. Family members, as well as hired-in workers, tend to work in these household enterprises.[14]

The first four columns of Table 2 show average annual values of working capital, physical capital, land capital and total capital used in farming and non-farming activities. We

[12]Labor force participation rates for both men and women are high in Malawi. Between 84% and 96% of working age people were working, or looking for work in different decades (results not shown).

[13]These bar charts are drawn using the 1998 Census, for which occupation and industry of work data are recorded at the two digit level. Prior Census years do not capture this level of detail for sector of work.

[14]In households with a non-farm business, 25% of women are family business workers, 66% are self-employed. For men in these households, 60% are self-employed, and 14% are family business workers.

compute total revenues (the value of production for market and for own consumption), net value added (revenue minus input costs), effective labor (total number of workers employed in the household business or farm weighted by the share of the year actually employed), and value added (or average product) of labor in farm and non-farm enterprises.[15] All monetary values are measured in 1997 USD. Panel A presents characteristics of farm businesses for the rural sample while Panel B shows data for non-farm businesses.

Three main facts stand out from this table. First, even when we assume that all land is used in farm production, non-farm work uses more than twice as much capital as farm work: 311USD versus 158USD. The gap is driven by large differences in the amount of working and physical capital used in production across these two sectors.[16] On average, households use 172USD in working capital in their home businesses, compared with only 20USD on their farms. Non-farm businesses also use ten times more physical capital (USD139) in their enterprises, relative to the average farming household that only uses 13USD. The value of land cultivated in farms is around 125USD, not sufficient to close the gap in capital used in farm and non-farm businesses.[17]

The second point to note is that annual revenues are over five times as large in the non-farm sector than in farming. Households earn 540USD per year in non-farm work and less than 100USD per year in farming, including the value of home production. For comparison, GDP per capita in 1998 in Malawi was 166USD.[18] Effective labor used in farming is less than one full time worker per year (0.44) while non-farm businesses use more effective units of labor (0.77). Non-farm businesses are also more capital intensive, using on average 12% more capital per worker than farming businesses (311/0.77 versus 159/0.44).

The third point is that on average, labor is more productive in the non-farm sector than in farming (Table 2, final column). The net value added of labor is the difference between annual revenues and total running costs (working capital plus labor costs) in each of the farm or non-farm businesses. Average labor productivity in the final column is value added in farming divided by effective labor units. On average, labor is 12% more productive in non-farm work than in farming. This gap in average labor productivity across sectors resonates

[15] We followed methods used in Gollin, Lagakos and Waugh (2014) to compute value added of labor inputs. Details of the dataset and variable construction are in the Data Appendix.

[16] Working capital is required to purchase all of the recurring non-labor inputs into production, for example: hybrid seeds and fertilizers for farms, business inventories for retail businesses, fabric for tailoring, etc. Physical capital includes assets owned by the household and valued using household reported values. We classify hoes, axes, sickles and pangas (similar to machetes) as farm capital, and pounding mills and bicycles as non-farm capital.

[17] Most farmers farm on very small plots of land (average size is 0.28ha, or about half the size of an American football field or two thirds the size of a soccer field). In general, land markets in Malawi are thin with most land held and allocated through customary practices (Restuccia and Santaeulalia-Llopis, 2015).

[18] World Bank Databank: `http://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=MW`.

with a recent literature on misallocation in low-income countries (see, for example, Gollin, Lagakos and Waugh (2014)).[19] While we do not directly address issues of misallocation in this paper, in the background is the notion that some combination of capital, credit and land market imperfections contribute to the average productivity gaps in Table 2. This is the background against which we examine the impacts of additional capital inflows from migration.

2.3 Migration as an alternative sector of work

International migration has always offered another sector of work for Malawians, most often men. In Dinkelman and Mariotti (2016), we describe the history of organized legal mine migration from Malawi to South Africa in the twentieth century. This migration was centrally administered by the mines' labor recruiting agency, the Witwatersrand Native Labour Association (*Wenela*).[20] Mine work was significantly more lucrative than wage-earning opportunities at home. Workers could earn at least 2.5 times more on the mines per year, relative to working for a wage on an agricultural estate in Malawi. Most of this money did return to Malawi because migrants were required by contract to save up to 60% of their earnings and receive this as deferred pay upon repatriation. These compulsory remittances, or forced savings, were the basis of a miner's ability to accumulate capital for use back in rural sending regions.

Figures 3a and 3b show the variation in migration and migrant capital that we use in our analysis. Data sources are described in more detail in Section 4 and in the data appendix. Figure 3a is reproduced from Dinkelman and Mariotti (2016) and shows the number of Malawian migrants employed on two-year contracts on South African mines in each year from 1950 to 1990. The migration episode we consider is the ramp up of migration in the late 1960s and the equally dramatic decline in migration in the mid-1970s. Before the middle of the 1960s, migration to work on South African mines was limited by recruiting quotas that were never larger than 2% of the working age male population. In 1967, a new labor treaty removed the quota and migration expanded from 40,000 to over 120,000 men in five years. This surge ended in April 1974, when a *Wenela* plane returning to Malawi crashed, killing all miners aboard. Then-president Banda banned all labor recruiting in the country

[19] Our individual level data indicate smaller gaps in value of output per worker than is shown for the typical country in that paper. Gollin, Lagakos and Waugh (2014) calculate the average productivity gap is around two. We do not adjust for any human capital differences across households in our calculations.

[20] Members of the South African Chamber of Mines gave this agency authority for recruiting mineworkers from across the southern African region. *Wenela* merged with the South African recruiting agency in the mid-1970s and became *Teba*, The Employment Bureau of Africa. Much of the archival material we use in our analysis are original documents from *Wenela/Teba* that we collected and digitized.

and recalled all miners. The number of Malawians working on South African mines fell to zero in the two years following 1974. By 1977, Banda had realized that mining money represented a crucial source of foreign reserves for the country and rescinded the ban on migration. However, migrant flows never returned to prior levels. By the 1980s, *Wenela* had redirected recruiting towards the South African labor market. Figure 3a shows clearly the impact of removing the labor quotas in 1967 on Malawian mine workers and the impact of the labor ban in 1974.

Flows of money paralleled the flow of migrants back to Malawi between 1967 and 1975, as shown in Figure 3b. We plot the log of total money flows (deferred pay plus voluntary remittances plus deposits) in 1975 USD and separate out the log of total deferred pay flows back to Malawi in each year.[21] Between 1966 and 1975, total migrant capital flows rose by about 20%. After the removal of the labor quota in 1967 (demarcated by the first red vertical line), deferred pay flows increase slowly at first and then more rapidly, as the number of migrants surges. Money flows spike up after the plane crash (indicated by the second vertical red line), when all current miners were reptriated. This later part of the migration period (1974-1975) represents the period of largest, coordinated capital flows back to rural districts in Malawi. Total deferred pay inflows over the entire period were 53 million USD. At peak migration in early 1973, Malawi received 2.75 million USD from miner earnings in a single month, or almost 115,000USD on average per district. Each migrant returning from a two-year contract would have received between 130USD and 295USD, depending on when he left.[22]

A district could receive more capital than other districts in one of four ways. Districts with more migrants received more deferred pay. The timing of when migrants left from a district would have affected total deferred pay eventually received by the district, because mine wages were rising over time.[23] Relatedly, districts with more migrants closer to the end of their contracts in 1974, at the time of the labor ban, would have received more deferred pay after the ban. Finally, districts with a larger share of migrants on repeat contracts – or, a smaller share of novices – would have received more capital since miners earned a small raise each time they recontracted. Changes in the types of migrants recruited over time were

[21] Amounts are converted (from GBP or MWK) to USD at the fixed 1975 exchange rate of 1.2 MWK to 1 USD.

[22] We take the total deferred pay flowing back to Malawi in each year from 1967 to 1975, and conservatively divide this by the number of migrants employed in South African mines two years prior (to account for the two year contract), to come up with this range. This is almost surely an underestimate of the total capital per returning miner, because it assumes that each migrant had only one migration episode.

[23] In the mid-1970s and early 1980s, the mining industry chose to raise mining wages alongside large increases in the global gold price (Crush, Jeeves and Yudelman, 1991). Between 1966 and 1974, nominal mine wages had increased by over 200%.

driven by the demands of the gold mining industry, rather than by changing patterns of labor supply in Malawi. In our empirical work, we exploit district-level variation in capital received, conditional on total number of migrants per district. These district-level differences stem primarily from differences in the time profile of migration from each district.

3 Conceptual framework: Temporary capital injections and long run changes in the labor market

The most direct mechanism through which the return of capital affects the structure of the labor market is through increasing local incomes. Local demand shocks generated by returning migrants increase the demand for farm and non-farm goods. As long as preferences are non-homothetic, the demand for – and hence viability of – small businesses in the non-farm sector will increase faster than the demand for food (Herrendorf, Rogerson and Valentinyi, 2014). This mechanism is similar to the demand externalities highlighted in big push models like Rosenstein-Rodan (1943) and Murphy, Schleifer, and Vishny (1989).[24]

The second channel through which capital can affect the labor market is by providing liquidity for farmers to invest in farm capital, like seeds, fertilizer, or farming equipment. In a closed economy – a reasonable assumption for districts in Malawi (Robinson, 2013) – more farm capital enables farmers to meet minimum food production requirements with less labor. Excess labor is then released to the non-farm sector. This channel may not be available, though, if other markets fail, for example, if farmers cannot access more land, or find it difficult to buy inputs like hybrid seeds and fertilizers.[25]

The third channel involves providing liquidity to the non-farm sector. More local financial capital could enable individuals to overcome fixed startup costs of entering the non-farm sector, and/or allow them to expand production in this typically higher productivity sector, if returns on capital investments are higher than in farming.[26]. Migrant may also act as financial intermediaries that lend money to entrepreneurs, thereby allowing the non-food sector to expand.[27]

[24]Diao, McMillan and Rodrik (2017) argue that aggregate demand shocks generated by foreign transfers or agricultural income shocks are the most likely factors driving recent patterns of structural change across Africa.

[25]Such market imperfections have been noted for Malawi, e.g. Beegle, Galasso and Goldberg (2016); Restuccia and Santaeulalia-Llopis (2015)

[26]Returns to capital in the non-farm sector, and the non-food agricultural sector, have been shown to be high in African settings (Udry and Anagol, 2006). Credit constraints in the non-farm sector are part of the explanation for why increases in migrant remittances lead entrepreneurial activities expanding in migrant households (Yang, 2008)

[27]Buera, Kaboski and Shin (2013) show how more capital in the economy can be a mechanism for structural

Finally, if migrant earnings are channelled towards investments in human capital, worker productivity in the next generation may be affected. If literate workers have higher returns in nonfarm sectors relative to farm sectors, this shift in the share of more skilled workers could lead to shifts in the sectoral allocation of labor over time.

Underlying each of these channels is the idea that before international migration, there is insufficient capital in the local economy to break out of a poverty trap. Incomes before the capital shock are so low that savings cannot be sustained, and people cannot afford to buy anything except food.[28] An increasing supply of capital in the economy enables a big push through some combination of the above channels, allowing households to spend more on non-food items, services and human capital investments; enabling other households to start up small businesses to supply this new demand. Importantly, in order for the temporary increase in capital to translate into long term impacts on the structure of the labor market, the expansion of the non-farm sector should generate more savings (i.e. allow for greater surpluses than in farming), and more investment (accumulation) over time. As savings and investment accumulate, the impact of the initial income shock persists.

In our empirical work, we examine how economies evolve after the end of the migration episode, once all migrants and all migrant money have returned to the economy. We test for whether capital had persistent impacts on local labor markets, conditional on the number of migrants from that district. We also test for evidence of investments in farm capital, non-farm physical capital, and human capital, aspects of accumulation that continue long after the end of migration. In the last section of the paper, we return to a discussion of how to interpret the effects of these capital shocks, given the theoretical possibility that migrants may have accumulated human capital abroad.

4 Empirical strategy and data

4.1 Main specification

To isolate the persistent effects of more migrant capital at market-level, we specify the following empirical model for labor market outcomes Y_{dt}:

$$Y_{dt} = \sum_t \alpha_t K_d Decade_t + \sum_t \beta_t L_d Decade_t + \kappa_t + \delta_d + W_d Trend_t \lambda + \epsilon_{dt} \quad (1)$$

change by facilitating more entrepreneurial activity.

[28] Insufficient savings and local capital are key ingredients in many poverty trap models, as described in Kraay and McKenzie (2014). Such models often provide justification for foreign aid transfers of money to developing countries.

where Y_{dt} is, for example, the share of workers in agriculture, manufacturing or services, d is the district, t is the decade (1977, 1987, 1998 or 2008), K_d is the amount of deferred pay in millions of USD received by district d between 1966 and 1975, L_d is the total number of migrants in thousands returning to each district between 1966 and 1977, $Decade_t$ is a set of decade dummies for one, two and three decades after the end of migration (1987, 1998 and 2008 respectively), κ_t is a decade fixed effect, δ_d is a district fixed effect, $W_d Trend_t$ is a vector of baseline district-level covariates interacted with a linear trend term, and ϵ_{dt} is an idiosyncratic error term. Baseline district covariates include literacy rates and population density in 1945, the share of men and women not earning any cash income in 1966 as a proxy for the local economy prior to the migration shocks, the share of men and women married in 1966, an indicator for whether the district is a malaria area, and two region indicators. Regressions are estimated separately for men and women.

District fixed effects control for constant average differences in labor markets across districts, for example districts with lake access could always support work in fishing industries. These controls also standardize for district population size. Decade fixed effects control for aggregate changes in the labor market that affect all workers equally, for example, a nationwide drought that occured in the early 1990s. Trend interactions flexibly allow districts with different initial population densities, literacy rates, marriage rates, malaria risk and potential for earning cash wages to evolve differently over time. We isolate the impact of K_d across districts with the same number of migrant men by controlling for L_d.[29]

Both sign and significance of each of the α_t parameters is important. α_{1987} tells us the percentage point change in the relevant employment outcome between 1977 and 1987, the first decade after an additional one million USD was received per district, while α_{1998} and α_{2008} give us the same parameter for the later decades. If effects of migrant capital dissipate over time, we should see $\alpha_{1987} > \alpha_{1998} > \alpha_{2008}$ for outcomes where the capital shock has a positive impact. Alternatively, if labor market effects of the shock persist, we should see $\alpha_{1987} \leq \alpha_{1998} \leq \alpha_{2008}$. Without data prior to 1977, our specification only allows us to estimate the effect of the capital shocks on differential *changes* (rather than level differences) in employment outcomes across districts after 1977.

We also examine a second set of outcomes that are strongly correlated with local labor market structure and common proxies for economic development: population density and

[29]In the Robustness Appendix, we show that our main results are somewhat stronger when we omit the district fixed effects and baseline controls interacted with trend terms. The point estimates are similar whether we exclude Lilongwe, the capital, or Blantyre, the former capital (although estimates become more noisy). We also show that the functional form of the control for number of migrants in equation 1 does not drive our results. We have similar findings whether we include the decade dummies interacted with linear number of migrants, with migrants and migrants squared, or with the log of migrants.

urbanization. These measures are interesting in their own right, because urbanization is another component of structural transformation. We estimate how these outcomes evolve differently before, during and after the shock. across high and low capital shock areas. We combine earlier years of Census data from 1945 and 1966 with the later years 1977, 1987, 1998 and 2008 and estimate the same specification as in equation (1).

Our main identification assumption is that districts receiving more capital before 1975 would not have evolved differently compared with those receiving smaller amounts of capital, in the absence of the capital shock. Importantly, our comparison of labor market trajectories from 1977 onwards controls for the total number of migrants before 1975. Differences across high and low capital shock districts are generated by differences in the timing and composition of migrants, not the number of migrants. As one check on this identification strategy, we show that spatial variation in the amounts of capital flowing back to each district is not correlated with any baseline district covariates that could be important for local labor market outcomes. As a second check, we present results for our main outcomes using only that capital flowing back to Malawi immediately after the plane crash. Finally, a benefit of using population density and urbanization outcomes is that we can also test for pre-trends in these variables across high and low capital shock districts. Density and urbanization are variables correlated with local labor market outcomes. So, if we see no differences in population growth across areas with more versus less migrant capital, before the migration episodes occur, this bolsters our claim that prior to the capital shock, these economies were not changing in different ways.

Mitigating against us finding any long run effects of the initial capital shock on specific districts is the possibility that capital returning to Malawi might move across space. In other settings, financial infrastructure is the key conduit for savings from the agricultural sector to flow towards the non-farm sector in urban areas e.g. Bustos, Caprettini and Ponticelli (2016). In Malawi, the almost complete lack of financial infrastructure limits such capital mobility. Miners and mining families had money transferred to them through the recruiting station network, or through the local post office. Neither of these institutions were lenders of money, so neither could be a force for formal financial intermediation. In the years since the end of labor migration, Malawi's banking network has barely changed. As late as 2014 (the latest year for which World Bank data exist (The World Bank, 2014a)), there were only 4.85 ATMS and 3.2 bank branches per 100,000 people respectively.[30] We therefore expect the effects of capital returning to Malawi via labor migrants would have been concentrated in districts to which these migrants returned.

[30]For comparison, India had 18 ATMs and 13 bank branches per 100,000 people in 2014.

4.2 Data and summary statistics

4.2.1 Labor market and population outcomes

We measure labor market outcomes, population outcomes, and district-level covariates using six waves of Census data from 1945 to 2008. We digitized historical Census data available at the district-gender level from 1945, 1966 and 1977 and matched this with Census data from 1987 (the 10% sample), 1998 (100% sample) and 2008 (10% sample). We weight up the 10% samples to the full population when creating these data cells. Details of variable construction are in the data appendix.

Key labor market variables are defined for men and women, using labor market questions that remain largely the same across survey instruments. Broad industry of work is available for all economically active individuals 10 years and over. We use these broad measures of industry – agricultural, manufacturing and services – to look at labor reallocation across sectors, as well as a finer breakdown of industries in the non-farm sector: general manufacturing, retail, transport and communication, and all other services, including personal services and government employment. Using the broader measures of industrial sector, we also construct a Herfindahl index that captures the diversity of employment within the district.

Data on total population and population by gender are available for each district from 1945 onwards, and on urban shares of population from 1966 onwards.[31] We use the 1966, 1977, 1987 and 2008 Census to construct district-specific measures of the number of cross-district inmigrants, outmigrants, and net migration rates before and after the labor migration shock period.[32] These measures allow us to test whether internal migration, across district borders, differs across districts with more or less capital inflows.

Table 3 presents summary statistics for our data. In 1977, an average district contained almost 55,000 working age men. Migration was widespread and a common phenomenon: an average of 20,000 men in each district had worked abroad at some point by 1977. Only 8% of the youth population was literate in 1945. Historical population density was around 30 people per square kilometer. 28% of districts are high malaria risk, based on average altitude in the district. About half of all districts grew some type of export crop (tobacco, cotton, sugar or tea) on agricultural estates, the location of the majority of low-skilled wage work in this economy. Between 38 and 47% of men and women did not earn any cash for their work activities in 1966. These last two variables are included as indicators for the pre-existing structure of the local labor market in each district.

[31] Nyasaland was part of a federation with Northern and Southern Rhodesia (Zambia and Zimbabwe) at the time of the 1956 Census. Data are not available at district-level in this Census wave.

[32] Migration questions are not asked in the 1998 Census.

4.2.2 District-specific capital flows and migration

We collected and digitized material from administrative records that capture district-month level remittance flows from October 1967 to November 1975. Three categories of monies were recorded by the mine labor recruiting agency: deferred pay, remittances and other deposits. 89% of all monies returning to Malawi were in the form of compulsory deferred pay; this is the measure of migrant capital we use in our analysis. Amounts are converted to USD, aggregated over time to district-level, and scaled so that one unit of K_d represents a one million dollar transfer over this period. The average transfer to a district over eight years was 2.25 million USD.

We do not have data on district-specific numbers of migrants leaving or returning each year between 1967 and 1977. Instead, we estimate the district-specific number of migrants during this decade by multiplying the national share of ever migrants who report returning to the country between 1967 and 1977 by the district-specific number of men who report ever migrating at all.

4.2.3 Predictors of district-level capital flows

As a first check on our identification strategy, we try to predict differences in district-level capital flows using historical district-level covariates. Ideally, the amount of capital coming back to a district would be unrelated to anything about that district related to local labor market performance. First, we regress total deferred pay over the whole period (K_d) on the baseline district covariates, and on the number of miners who returned to each district by 1975 (Table 4, columns (1) and (2)). We also regress deferred pay received by the district in each month and year on month and year fixed effects, to control for the effects of common time-varying reasons for increases in capital (e.g. rising mine wages), aggregating these residuals up to the district-level. Then, we regress these district-level residuals on the set of baseline district covariates, and the number of miners who returned to each district by 1975.

Results are very similar across specifications. Without controlling for the number of migrants, the likelihood of malaria in a district reduces total deferred pay received. However, once we control for total number of migrants, the relationship between malaria risk and total deferred pay is substantially attenuated. This suggests malaria affected total migrant capital flows to a district by reducing the total number of miners recruited from a district. In fact, once we control for the number of migrants from a district, none of the baseline district-level variables are correlated with total deferred pay received by the district. Moreover, the relationship between total migrants and total deferred pay received disappears disappears once we control for aggregate (month and year) time effects. This reassures us that districts

receiving different levels of K_d, conditional on the total number of migrants, are not different on observables in the pre-period.

5 Main results

5.1 Structural change in high versus low migrant capital districts

Figures 4 and 5 use the raw Census data to illustrate our basic result of differential structural change in labor markets across districts receiving different injections of migrant money. The first figure shows female employment by sector over time, the second figure shows patterns for men. In each figure, we plot the average share of workers in the agricultural (left panel) or services (right panel) sector in each decade in districts receiving above median (solid line) or below median (broken line) levels of deferred pay. We do not control for any variables in these figures.

Shares of men and women working in agriculture start out roughly the same in high and low capital shock districts in 1977, two years after all migrants have returned home. By 1987, these districts begin to diverge, with the shift out of agriculture occurring faster in the high capital shock places. Patterns in the service sector are reversed: while high and low capital shock districts start out at similar rates in 1977, by 2008, there are much larger shares of workers in services in the high capital shock districts. Labor shifts into services to a greater extent in districts with the larger capital inflows. The effects of the capital shock persist, and grow larger, over time. Men shift out of farming first, with women lagging this shift by about a decade. Next, we investigate whether these patterns hold when we control for district fixed effects, year fixed effects, and interactions of baseline district covariates with trend terms.

5.2 Impacts on broad sector of work

Table 5 presents our main results for the broad categories of employment in agriculture, manufacturing and services, and the Herfindahl measure of employment diversification. Panel A shows estimates for women, Panel B for men. The unit of observation in each regression is the district-gender-decade. For each outcome, we present estimates of α_t from equation (1), including all district fixed effects, decade fixed effects, and interactions of all baseline district-level controls with a trend term. For each outcome, the first column presents estimates excluding controls for the number of migrants in each district, and in the second, we include these controls and present estimates for β_t as well. Regressions are weighted by

population. Robust standard errors are clustered at district level. We report statistical significance using p-values from the small sample t distribution to account for the small number of districts (24).[33]

In districts that received larger capital inflows, more female and male workers shifted out of agriculture, into manufacturing (for women) and services, and the industrial concentration of employment fell. These effects are still present, although attentuated, when we control for the number of migrants carrying back this capital. Districts with larger capital flows experienced more structural transformation, as labor reallocated away from agriculture into the non-farm sector. For all sector of work outcomes in Panel A, the p value for the joint test of the migrant capital interaction terms strongly rejects zero.

Labor reallocation in the wake of the migration shock reduced the concentration of employment in agriculture within districts. The average value of the Herfindahl index is 0.8. In districts with larger capital shocks, this index fell between 0.006 and 0.015 in the decades following the end of migration, indicating a larger reduction in concentration of work – or more diversification – in these districts. These effects are also somewhat attenuated when we control for the number of migrants in column 8: the index falls by 0.003 and 0.009 in the two decades after the shock.

Are the magnitudes of these shifts sensible? For each additional one million dollars that flowed back to a district before 1977, the share of women working in agriculture fell by 0.36 percentage points in the first decade following the shock, by 1.26 percentage points in the next decade, and by 1.6 percentage points by the third decade after the shock. These effects are between one and two thirds as large when we control for the number of male migrants: in column (2), the share of women in agriculture fell by 0.1 percentage points by 1987, and by 0.8 percentage points in the second and third decades after the shock. Column (4) shows smaller shifts of women into manufacturing (between 0.09 and 0.1 percentage points) and column (6) shows larger shifts into services (0.8 percentage points by three decades after the shock).

Panel B shows similar patterns of structural change for men. More capital coming into the district also shifted male employment away from agriculture, and towards services. The share of men working in agriculture fell by 0.6, 1.1 and 0.5 percentage points respectively in the first, second and third decades after the shock. In column (2), these effects are attenuated when controlling for returning migrants, but the share of men in agriculture still fell by between 0.4 and 0.7 percentage points in two decades following the end of migration. Shifts

[33]We show in the Robustness Appendix that our results are robust to not using weights, to excluding all of the baseline district covariates, and to estimating wild cluster bootstrapped standard errors. The p-values generated from the wild cluster bootstrap procedure in the unweighted regressions reflect largely the same pattern of significant results as the p-values taken from the small sample t-distribution.

into the service sector were positive. Male employment in services increased by 0.1, 0.5 and 0.1 percentage points respectively, although these changes are only statistically significant in 1987.[34] These changes are reflected in increased diversity of work for men (columns 7 and 8): the concentration index falls significantly in the first and second decades following the end of migration, with magnitudes (relative to means) similar to effects for women.

Overall, the employment shifts in response to the capital inflows are positive, and persistent, although not massive. They suggest some measure of structural change facilitated by exposure to labor migration opportunities. In an average district, with 58,000 women and 57,000 men in the economically active population, each additional one million USD received created 1,402 more jobs in the non-farm sector over three decades. This translates into a cost of 713USD per non-farm job created. We can construct a back-of-the envelope estimate of how much migrant capital contributed to overall structural change over time. In the four decades before 2008, employment shares in agriculture fell by around 24 percentage points for women, from 94% to 70% (Table 1). If we sum up our estimates of the β's in Table 5 column (2) (-0.00851 + -0.00874+-0.0011 =-0.01835) and multiply by the average amount of migrant capital received by a district (2.25 million USD), we estimate that migrant earnings in an average district accounted for about 17% of the structural reallocation of female labor out of farming and into non-farm work. The contribution of migrant capital to reallocation of male labor across sectors is smaller, at around 5%.

5.3 Isolating variation in migrant capital following the plane crash

As a second check on our empirical strategy, and to be more confident that our results are not driven by differential selection into when districts send more migrants, we can focus on that part of K_d that returns to Malawi immediately after the plane crash. This allows us to exploit an even more subtle difference between districts: districts with a greater number of migrants closer to the end of their contracts in April 1974 would have received more capital than districts with a greater number of migrants closer to the start of their contracts in that month. Arguably, cross-district differences in the timing of migration just around the April 1974 threshold are much less likely to be driven by differences in local labor market conditions in Malawi or by differential migrant selection across districts.

In Table 6, we present the main results on sector of work for women (Panel A) and men (Panel B) using only this post plane crash variation in migrant capital. All other controls are included in each specification. Coefficients in this table should be scaled to (multiplied by) the mean of capital inflows during this time, 0.6 million USD per district. Doing this, we

[34]The p-value for the joint test of the capital shock interaction terms reject no impact of capital on employment in agriculture and service sectors for men.

see very similar patterns of structural change as in Table 5: women shift out of agriculture and into services, and men seem to do the same. The shifts for women start later, and continue for longer, than the shifts for men. Overall, our results using the full amount of migrant capital are quantitatively similar to results using only the post-plane crash amount of migrant capital.

5.4 Impacts on narrow sector of work

What types of manufacturing and service sector work developed in high capital shock districts, in the thirty years post-migration? Table 7 presents a finer breakdown of sector of work for the non-farm sector: general manufacturing and construction, general services, retail, and transport and communications. General services include personal services (e.g. guards, domestic workers and cooks), business services (advertising, or insurance, banks and engineers, legal services, accountants) and other services (e.g. barbers, tailors, typists, public sector workers).[35] The retail sector includes wholesale and retail trade of food, fuel and other goods, hotels and restaurants, car repairs etc. Transport includes transport of goods and/or people, including using buses, taxis, boats, bikes, warehousing, and telecommunications. All specifications follow the form of equation (1).

These estimates indicate that men and women experience similar reallocations across subsector of service employment. For each additional million USD received before 1977, the share of women working in construction rose by between 0.04 and 1 percentage points, in general services by 0.1 percentage points, in retail by 0.3-0.6 percentage points, and in transport by 0.1-0.2 percentage points. Relative to mean levels of employment in each non-farm sub-sector, the largest increases for women were in construction and general services. For men, more capital in the district shifted work out of manufacturing (0.1-0.4 percentage points) and transport (0.1 perecentage points) and into construction (0.2-0.5 percentage points) and retail (0.1-0.6 percentage points). The largest relative shifts for men were towards construction. For women, the impacts of the capital shock on movement into construction, services and retail persist and grow larger over time.

5.5 Impacts on type of worker

Section 3 showed that household enterprises use a great deal more working and physical capital than family farms. This observation suggests that migrant capital could have been important for overcoming startup costs of family enterprises, and for providing access to

[35] We omit mining as a separate category since shares working in the local mining sector are so low. Most of those in business services classify themselves as working proprietors.

capital to allow entrepreneurs to self-finance their businesses. In turn, the demand for workers in family enterprises would be affected.

Table 8 provides some evidence that this is indeed happening. The results in this table come from regressions of the form in (1), using outcomes that describe the share of workers (in all sectors, columns 1-3, or in the service sector only, columns 4-6) that are self-employed, working without pay in family businesses, or working for a wage. Panel A shows how access to migrant capital affected the employment situation of women, Panel B for men.[36]

The first three columns of the table tell us what happened to the form of work for workers across all sectors of the economy. In districts receiving more migrant capital, men and women shift towards working on family farms, and in family businesses. Women shift out of self-employment: this reflects the move out of agriculture, since many farmers report being self-employed. In columns (4) through (6), we see that conditional on working in the service sector at all, districts with more capital inflows have a smaller share of (male and female) wage workers, and at the same time, a larger share of women working in family businesses, and a larger share of men reporting that they are self-employed. These patterns are consistent with the temporary capital injection from returning migrants enabling households to start up new businesses, and shift some of their labor resources into off-farm activities.

5.6 Impacts on population growth and urbanization

As a second set of outcomes, we investigate how migrant capital inflows affected population growth and urbanization within districts. We estimate versions of equation (1) using population variables P_{dt} measured at district-year, and sometimes gender and age group level, as outcomes. We control for number of total migrants between 1966 and 1975 in all regressions. t now includes six years of Census data from 1945 to 2008 for population outcomes. Regressions are unweighted, and standard errors are estimated as before.

Figure 6 plots estimates of α_t, the relationship between the amount of capital received by each district between 1966 and 1977, and district-level population before and after the migration surge. Standard errors bars are included, and the omitted category is 1945. Each point on the line represents the marginal impact of receiving one million USD of deferred pay between 1966 and 1977, on the level of population in the district in each Census year.

Relative to a district receiving no deferred pay, a district that was going to receive one million USD in capital between 1966 and 1975 had lower population prior to the capital shock. After 1966, this pattern reversed. Districts receiving more deferred pay started to increase in size, and significantly so, by 1977. This growth is sustained in the ensuing years:

[36] One caveat to interpreting these results is that we do not have a consistent variable capturing type of work in the 1977 census. We can only examine changes between 1987 and 2008.

after the end of the migration shock, the districts with more capital continued to have larger populations in 1987, 1998 and in 2008. Although confidence intervals are wide, the impact of the capital shock on population is positive and significant in 1977 and in 1987.

Table 9 presents the corresponding estimates for regressions of log population (so we can examine impacts on growth rates), log female population (so we can rule out the growth is mechanically related to returning migrants), the log of population in different age groups (under age 5, ages 5 to 18, and over age 18, so we can investigate a potential fertility impact of returning migrants), and the share of population in urban areas (so we can investigate urbanization). In each case, the specification is the same as in equation (1), including all controls.

In the first column we see the same pattern of coefficients for log population and log female population as reflected in Figure 6 for total population. One decade before the end of migration, total population and female population were growing more slowly in districts that were going to receive large capital inflows. By the end of the labor migration period, total population and female population in the high capital inflow districts had increased by 2.8 percentage points and 1.8 percentage points respectively. This growth continues and grows larger over time. By 2008, districts that experienced the largest capital inflows had grown 4.2 percentage points faster than other districts. Female population grew 3.3 percentage points faster.

Columns (3) to (5) in the table show that the fastest population growth occurred in the youngest (under 5 age groups). This suggests that returning migrants and migrant capital may have affected population growth directly, through increased fertility or reduced infant mortality.[37] Population in older age groups continued to be higher in districts with the largest capital inflows, although the coefficients on these interaction terms in columns (3) to (5) are not statistically significantly different from zero.

Shifts in the location of economic activities from rural to urban areas are an additional aspect of structural change. Table 9 column (6) shows that the increase in population in response to migrant capital was accompanied by increasing urbanization rates. By 1977, districts that received one million USD more than other districts had 0.4% more of their population living in an urban area, a 10% increase in the urbanization rate. This gap in the share of population in urban areas persists, and grows larger over time. By 2008, districts that had larger capital shocks in the 1970s were 0.6%, or 15% more urbanized, relative to districts with no capital shocks.

Figure 6 and Table 9 provide powerful arguments against concerns that districts receiv-

[37] In ongoing work, we are conducting a more detailed investigation into the demographic impacts of the migration shocks.

ing the largest capital inflows were already on a growth trajectory prior to 1966. There are no positive pre-trends in population, both of which are likely correlated with differences in local economic conditions. In combination with the earlier Figures 4 and 5 showing a similar allocation of employment across sectors at the end of the migration shock in high and low capital shock districts, the results for these population outcomes bolster our identification assumption: that districts receiving more migrant capital between 1966 and 1975 would have experienced the same changes in local economic conditions in the absence of the migration shocks. They also show that the capital shocks induced some population growth that persisted over time, and that this was not simply an artifact of returning male migrants.

5.7 Does internal migration contribute to structural change?

If internal (cross-district) migrants are always more likely to work in the service sector, any district with higher positive net migration rates (number of inmigrants minus number of outmigrants as a share of the district level population) could see employment shifting out of the service sector and away from farming purely because of the movement of jobs across space. This compositional shift in the workforce would be part of what we estimate in high capital inflow districts. A movement of labor towards districts receiving more money could itself be the result of the demand channel through which increasing capital affects rural labor markets.

To investigate this possibility, we use internal migration information from the 1966, 1977, 1987 and 2008 Census. From these Census waves, we calculate the number of people who were born in a district, the number who currently reside in a district, and the number who have left their district of birth or moved from another district of birth to their current district of residence.[38] We compute three measures of internal migration ($MigRates_{dt}$): the number of inmigrants (people currently residing in a district who were born elsewhere), the number of outmigrants (people born in the district but currently residing elsewhere), and the number of netmigrants (inmigrants minus outmigrants). We express each of these numbers as a rate per 1,000 residents currently living in the district, so that, for example, a net migration rate of 10 means that there were 10 more inmigrants relative to outmigrants, for each 1,000 people in the district.

We estimate equation (1) using $MigRates_{dt}$ as outcomes. Table 10 presents estimates of α_t, the impact of migrant capital inflows on inmigration, outmigration, and netmigration rates in the district. The omitted category is the interaction between the Census 1966 indicator and total deferred pay received by the district.

[38] Internal migration questions were not asked in the 1998 Census.

Results in Table 10 suggest high migration rates across district boundaries. There are 275 inmigrants and 278 outmigrants for every 1,000 residents. Because each district received a lot of inmigrants and sent a lot of outmigrants to different districts, the average net migration rate is low, at 3 per 1,000 residents, or 0.3%.[39] If we take signs and magnitudes at face value (ignoring the lack of significance), districts receiving more capital look like they have less net migration (more outmigration, less inmigration) after 1966, although the size of these effects shrinks over time. However, none of inmigration, outmigration, or net migration are significantly higher or lower in districts that received the largest capital shocks in the 1960s and 1970s. A movement of service sector workers across districts, towards areas of high capital inflows, is therefore unlikely to account for our main employment reallocation results.

6 The persistence of accumulation

We investigate three investment channels through which the impacts of the capital shock could have persisted to generate long-run shifts out of agricultural work and into the service sector. First, we look for evidence of investments in capital used in agriculture. Second, we examine what happened to physical investments in the non-farm sector. Third, we examine impacts on human capital investments of the next generation of workers. Farm and non-farm investment outcomes are measured at district-level across different Census years, with most of these outcomes measured before and after the migration episode. Human capital outcomes are measured at district-cohort level, where cohorts span the period before and after the migration shock. We estimate regressions that take the form of equation (1), but where t now includes observations from before the migration shock.

6.1 Long run investments in farm and non-farm physical capital

In Panel A of Table 11, we look at changes in ownership of productive farm assets after the migrant capital shock. We measure ownership of hoes, pangas (similar to machetes), any livestock, and oxcarts. Outcomes are taken from the National Sample Survey of Agriculture in 1968 and the National Household Income and Expenditure Survey data in 1998 and weighted up to district level using sample weights (see Data Appendix for details). For hoe, panga and livestock outcomes, we can measure the share of households owning any of these items before, and twenty years after, the migration shock. Oxcart ownership is only

[39] Marriage migration is likely part of this internal migration, as different areas of the country follow matrilocal or patrilocal marriage customs.

measured in 1987, 1998 and 2008. Overall, we find no evidence that districts with more capital were investing in more farm-specific capital over time. This lack of impact on farm investments lines up with the low levels of physical capital in farm businesses reflected in Table 2.

In Panel B of Table 11, we examine changes in ownership of assets that are used more generally in non-farm work. We measure the share of households in the district in a given year that have durable walls, a durable roof, and both durable walls and a roof, a radio and piped water. Radio ownership is measured in all Census waves, while the other outcomes are measured in a subset of years. We indicate which years of data are used in each regression in the table. All outcomes in this panel, except piped water, are measured prior to the migration shock (1968/9) and for some years after the shock.

In the ten years after the capital shock, districts receiving the largest amounts of deferred pay saw increases in the share of households with a radio in 1977 (1.4 percentage point increase), although this impact fades over time.[40] Additionally, districts receiving more capital also see increases in the share of households with durable walls and roofs, and a durable roof alone. The share of houses with better quality housing increased by 1.3 percentage point increase, or 10%, in the decade following the capital inflows. This result ties in nicely with the result from Table 7 that more men and women were employed in the building and construction sector. Note that for many types of self-employed work in the service sector, a more durable home may be also represent an important investment in protecting inventory (for retail trade) and/or for offering services (e.g. as a restaurant, bar, hairdresser etc).[41]

6.2 Long run impacts on human capital of the next generation

In Dinkelman and Mariotti (2016), we showed that districts more exposed to the migration shock through the location of the recruiting stations invested more in human capital of those who were children at the time of the migration shocks.

In Table 12, we use the same sample of individuals from that paper to explore a parallel analysis in the current setting. We focus on adults aged 20 to 65 in 1998 and ask whether human capital investments are higher in cohorts living in districts receiving the largest capital inflows during their years of primary school eligibility. We estimate the following regression for education outcomes of cohort c in district d for gender g ($Educ_{cdg}$) using data from Census

[40] The reversal of the positive coefficient on the capital shock interaction in the later period for radio ownership might indicate that these districts see larger shifts into TV ownership, although this is not something we can measure in every Census wave.

[41] Property investments have been used as an indicator of entrepreneurship in other settings (Yang, 2006, 2008).

1977 (to construct cohorts ages 40 to 55) and Census 1998 (to construct cohorts ages 20 to 44):

$$Educ_{cdg} = \gamma_1 K_d EarlyTreated_c + \gamma_2 K_d LateTreated_c + \gamma_3 K_d PostTreated_c + \sum_c \rho_c L_d C_c + \eta_g + \phi_c + \mu_d + W_d Trend_c \sigma + \omega_{cdg} \quad (2)$$

We exploit an additional piece of time variation (related to timing of birth) to check whether cohorts eligible for primary schooling between 1966 and 1973 (the $EarlyTreated_c$ cohorts) had more education in the long run, if they were in high capital inflow districts. We perform the same check for differences in education levels across cohorts eligible for primary schooling in the 1974-1977 period ($LateTreated_c$ cohorts) and for those eligible at the end of the shock, 1977-1980 ($PostTreated_c$ cohorts), across high and low capital shock districts. Our control cohorts here are those eligible for schooling before 1966. All other controls are the same as in equation (1), including district fixed effects.[42] We add cohort and gender dummies, as well as cohort interactions C_c with the number of returning migrants.

The table shows that for each additional million USD received by the district, education rose by around 0.10 years in early treated cohorts, by 0.136 years in late treated cohorts, and by 0.117 years in post treated cohorts. We can reject equality of effects in the early versus late cohorts, and in the late versus post treated cohorts. Results are similar for the extensive margin of attending any primary school, with effects largest for late treated cohorts in high capital inflow districts. Because human capital is a long-lasting asset, we can interpret these results as additional evidence that migrant capital was invested and had impacts at market-level.

Microeconomic evidence suggests that improvements in schooling contribute to greater shifts of labor out of farm work and into off-farm work (e.g. Gisser (1965) and Huffman (1980) for the historical US, Yang (1997) for China and Fafchamps and Quisumbing (1999) for Pakistan). In the Malawian setting, it is likely that the human capital investments triggered by migrant capital contributed to the structural shifts of labor out of agriculture and towards services. Because human capital takes time to produce, this investment could only play a role in accounting for the structural reallocation in the later parts of our study period.

To get a sense of how much the additional human capital might have contributed to the shift in sector of work out of agriculture and into services, we can focus on the changes

[42]The trend term here is a series of cohort level dummies, hence the notation $Trend_c$

between 1998 and 2008. We divide our estimate of the impact of an additional one million USD in migrant capital on the percentage loss of workers employed in agriculture (for women, the share of workers in farming falls by 0.0085, or 0.85 percentage points in Table 5 column 2 row 1) by our estimate of the impact of an additional one million USD in migrant money on the percent gain in years of education of the most exposed adult cohorts (the *Late Treated* cohorts gain an additional 0.136 years of education in Table 12 column 1; relative to average levels of education this is a 0.053 percent gain, or 0.136/2.55). The human capital gained as a result of the migrant capital inflows is therefore estimated to have contributed about 17% (0.85/0.053) towards the total shift out of agriculture among women in the later part of our period. This contribution is smaller for men, who experience a smaller shift into the service sector in the same period. Based on this back of the envelope calculation, human capital accounted for at most one fifth of the shift out of farming, but only in the later years of our sample.

6.3 Did migrant capital injections have lasting impacts on well-being?

Structural reallocation of the labor market is a process that is almost synonymous with economic development. But whether structural transformation translates into improvements in well-being depends on whether the movement of labor across sectors allows people to earn more for their labor. While we cannot measure incomes over time in Malawi, we can ask whether districts that received more capital after the migration shock end up wealthier than districts that received less capital, fifteen years after the end of migration.

We examine differences in household wealth using the 1992 Malawi Demographic Health Survey (DHS). We look at the cross-sectional correlation between measures of household wealth in 1992 and the amount of migrant capital received by each district by 1977, controlling for an increasing number of covariates. Because we can only measure wealth outcomes in the cross-section, we need to assume that baseline district-level controls (population density, literacy rates, a malaria risk indicator, the share of men and women married in 1966 and working for no wage in 1966) and region fixed effects account for any differences in initial wealth conditions across districts.

Table 13 shows that larger injections of migrant capital in the 1970s are indeed strongly and significantly correlated with households being wealthier fifteen years later. Each cell in the table presents the estimated coefficient on the migrant capital variable (measured in millions of USD) and its associated standard error, along with the number of observations in each regression in brackets. Our outcomes include the DHS wealth index (units are in

standard deviations), the count of household-level assets (some of them the same as in Table 11), and ownership of specific assets like electricity, radios and cars.[43] In the first column, we show the estimated coefficient from regressions of each outcome on the migrant capital variable with no other controls. The remaining columns show how these estimates change when we add additional controls. In column (2), we add the number of migrants; column (3) includes region fixed effects, column (4) adds district level controls and column (5) includes household-level characteristics (age, education and gender of household head, and household size).

Communities that received a larger injection of migrant capital are wealthier in the long run. An additional one million USD received by the district increases a household's wealth index by 0.05 standard deviations (column 1), and this effect is robust to including controls for number of migrants and region fixed effects. When we add district fixed effects, the estimate falls somewhat to 0.04 standard deviations. In the final column, when we add in controls for household level variables, the estimate for the wealth index outcome falls further to 0.016 standard deviations. However, household-level variables like household size and level of education of the household head may have been directly affected by the capital shock. For that reason, our preferred specification appears in column (4), where we include all controls except household- level observables.[44]

The same patterns are observed for many of the other outcomes: households in districts that received more migrant capital have more total assets, and are of higher quality, results that reflect our earlier findings on the investment channels. Households in these districts are also more likely to have electricity, a radio, and a car. Interestingly, they are not differentially likely to have access to utilities that are often provided through public means, e.g. improved toilets and improved water sources. The lack of correlation between migrant capital and the public infrastructure outcomes suggests that government spending on infrastructure projects in the post-migration period were not being targeted towards areas that received the largest amounts of migrant capital. Rather, the additional migrant capital returning to districts translated into higher privately-held wealth within households.

[43]The DHS wealth index is an index of assets constructed used principal components analysis. For more detail on how the variable is constructed, see `https://dhsprogram.com/programming/wealth%20index/DHS_Wealth_Index_Files.pdf`

[44]District-level regressions using data collapsed to the district reflect very similar patterns. See Robustness Appendix Table 7.

7 Discussion

One remaining question is what role the migrants themselves played in generating the structural reallocation of labor after the end of migration? The migration literature suggests several differences in migrant behavior relative to non-migrant behavior that could contribute to structural changes in the labor market over time. For example, migrants and their households might be more likely to set up businesses upon return (Yang, 2006; Woodruff and Zeneto, 2007; Yang, 2008, 2011), or might return with more human capital specific to non-farm sectors (Dustmann and Kirchkamp, 2002; Dustmann, Fadlon and Weiss, 2011). In our setting, it would have to be the case that migrants from later in the period are more likely to behave differently than migrants who leave earlier in one of these ways, and that these differences in behavior drive the persistent impact of the capital shock on the structure of work in Malawi.

There a few reasons why these typical mechanisms through which returning migrants affect their home countries are unlikely to be major drivers of our results. First, our main results are robust to using the shock to migrant capital generated immediately after the plane crash. The variation in capital around the shock is driven by small differences in the timing of migration flows across districts, so it is unlikely that the structural shifts we measure in response to this restricted version of the migrant capital shock are explained by differences between early versus late returning migrant behaviors. Second, miners had little opportunity to pick up useful skills on the mines. Mining related skills would not have been easily transferable to the farm or non-farm sectors of work in Malawi, and miners in South Africa were segregated from the rest of the economy in mine compounds, given them limited exposure to a more advanced market. Third, there is no evidence that returning Malawian migrants entered the non-farm sector in disproportionate numbers when migration ended. In fact, the share of service sector workers in 1977 is substantially lower in the ever-migrant male population relative to average shares in the population (see Appendix Table E1). These national patterns are inconsistent with the notion that returning migrants start up small businesses at higher rates, or return with aspirations to leave the farm, or bring back more human capital relevant for the non-farm sector. They are also inconsistent with the idea that migrant expectations about future work changed in the wake of the labor ban, prompting migrants to invest in household enterprises at higher rates, so that these businesses might sustain them as migration opportunities vanished.

Coming at this from a different angle, we can compare our results to recent empirical evidence that capital injections – not triggered by migration – were important for immediately changing the type of work that people in rural villages could do. Kaboski and Townsend

(2012) analyzed the impact of district-level injections of microcredit across communities in Thailand. Transfers to individual households within villages of different sizes ranged from 100USD to 1,000USD, somewhat larger than the average transfer returning to a migrant household in Malawi. In the Thai setting, more capital (credit) at market level increased consumption (especially for items that are typically income elastic), and increased income growth derived from small businesses and labor income for up to seven years after the end of the program. The results in this paper suggest that additional local credit boosted local consumption, allowing some household enterprises to scale up production and increase revenues. The microcredit facilitated local financial intermediation, that had persistent impacts on income generation activities.

In a different setting, Bandiera et al. (2016) analyzed the impacts of a randomized asset and skills transfer program to women in Bangladesh, where the rate of female labor force participation is far lower than in Malawi. The treatment, a one-time transfer of livestock assets combined with skills training that cost about 1,100USD (PPP dollars), raised the share of women working at all and channeled this work into the most profitable agricultural jobs. Asset accumulation continued for at least seven years after the end of the program.

Our long-run results line up nicely with this evidence on how non-migrant-induced temporary capital injections affect local labor markets. While we cannot know whether we should expect helicopter drops of cash to produce the same persistent impacts on the structure of work in local labor markets over the long run, the results of the three papers together suggest an important role for the level of capital in the economy to play in affecting the types of work that people are able to do.[45] Of course, from a policy perspective, the lessons from the quasi-experiment we analyze in Malawi are relevant for countries considering (or evaluating) programs of temporary or seasonal contract migration. When such migration flows are widespread, and accompanied by large return flows of money, impacts on the local labor market can be persistent. However, in order to observe these effects, outcomes may need to be measured over a long enough period of time.

8 Conclusion

This paper marshals historical data from Malawi to provide quasi-experimental evidence on how the return of migrant capital affects the structure of rural labor markets in the long run. Exploiting two plausibly exogenous shocks to migration that expanded and then contracted

[45] We do not compare our results to the impacts of foreign aid, since aid is distributed through governments. In contrast, earnings from migration, loans through the Thai program, and capital through the Bangladeshi program are all directly received by individuals or families.

the number of migrants, and generated a large inflow of capital to sending areas, we find that districts receiving more capital – conditional on the number of migrants – experience structural changes in their labor markets over three decades. Employment shifts out of agriculture, and towards the service sector for both men and women. Jobs in construction, retail, general services, and transport and communications increased and employment became more diverse in those districts that received more capital from migration. Even after the end of migration, accumulation persisted at higher rates. Districts with more migrant capital invested more in physical, non-farm capital and in human capital over the long run, and are wealthier.

Our work sheds light on a relatively unknown period in Malawi's economic history and is broadly relevant to African labor markets in the past and present. Many southern African countries were affected by similar fluctuations in worker flows to the South African gold mines. Structural change could also have occurred in these other countries as a result of capital accumulated through international labor migration. Given current demographic trends in Africa and little sign of industrial, agricultural, or trade revolutions that might trigger structural change, our work suggests that legal, time-limited migration might present one practical way to accumulate capital in labor-rich, resource-poor countries. Such migration, and migrant money earned abroad, could have long-term consequences for the allocation of labor across sectors at home.

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A Data Appendix

This appendix describes the data sources we used to construct the analysis datasets used in Dinkelman, Kumchulesi and Mariotti (2016) "Labor migration, capital accumulation, and the structure of rural labor markets"'.

A.1 Census data

Our main datasets are constructed from Census data collected in 1977, 1987, 1998 and 2008. The 1977 Census data were digitized from aggregate Census reports. The 100% microdata from the 1998 Census was obtained from the Malawi National Statistics Office. IPUMSI (`https://international.ipums.org/international/`) provides provides access to the 10% sample for 1998. The 1987 and 2008 Census data are 10% samples from the IPUMSI repository.

We also use data for some outcomes from earlier Census data in 1966, 1945 and 1931. We digitized all relevant tables from aggregate Census reports in these years (Malawi National Statistical Office, 1969; Nyasaland Governor, 1946, 1931).

A.1.1 District boundary crosswalk: 1931 to 2008

We created a district boundary crosswalk that links district boundaries over time, through name changes and boundary changes. We use the districts existing in 1977 as the sample of districts. We consolidated information in variables from districts that had split in later years into their origin districts in 1977. For districts in earlier years that had split by the late 1970s, we apportioned the earlier cell totals to 1977 district boundaries using area weights.

A.2 Labor market outcomes

We create three categories of labor market variables: broad sector of work variables, narrow sector of work variables, and economic activity status variables.

Broad sector of work: We define work in the agriculture, manufacturing, or service sector for each Census, using the number of people who are currently economically active (those employed and currently unemployed) in the denominator. Houseworkers and other inactive people (students, pensioners, other dependents) are excluded from both numerator and denominator of these variables. In each year, a small share of those in the labor force do not report an industry (most of these are unemployed people who have not worked before), so shares across the three broad sectors do not sum to one. For a more detailed definition of sector of work within the nonfarm sector, we disaggregate all non-agricultural employment into mining, manufacturing, retail, transport and communications, and all other services (business services, household services, and other non-specified services).

To create a summary measure of employment diversity in the district, we construct a Herfindahl index for (broad) industrial sector of work. The smaller the value of this index, the more evenly people are distributed across sectors. The larger the value of this index, the

more people are concentrated within one of the three sectors.

Economic activity variables We define these variables for the sample that includes everyone in the relevant age group in a given district:

- In the labor force: working, unemployed, or doing home production
- Working: working or doing home production
- Subsistence: working as mlimi (subsistence farmer) or doing home production
- Family business worker: working in a non-farm family business
- Self-employed: working in a non-farm business for themselves
- Wage worker: working for someone else for a wage or salary
- Employer: employs other workers in a business

Economic activity variables and sector of work variables differ because the economic activity variables capture activity shares in the entire population, not just those in the labor force. Home production workers (mostly women) are excluded from sector of work variables but included in the economic activity variables. Our data show that the majority of family business workers, self-employed, wage workers and employers work in the non-farm sector.

In Tables A1 and A2 on page 42, we compare the wording of Census questions across years. For the most part, it is possible to create a consistent set of definitions of each of the above variables, using combinations of different Census questions.

In 1977, 1987 and 1998 (and all prior Census years), the Census was conducted in September or October which is at the start of planting in the new agricultural season. The 2008 Census deviated from this pattern and was conducted in June, which is at the start of the dry season, between harvest and planting for the next agricultural season. This means that overall (in all districts and for all age groups), agricultural employment is lower relative to employment measured in the planting seasons, September and October. Dinkelman and Kumchulesi (2016) discuss the implications of this change in timing of the Census on employment outcomes in the face of seasonality in labor requirements. In the current paper, the level effect of this change in timing of the Census are accounted for by a year fixed effect for 2008. We also show our main results are robust to excluding the 2008 data.

Table A1: **Occupation and Industry Questions in Malawi National Census**

Census 1977	**Census 1987**	**Census 1998**	**Census 2008**
Sample: 10 years + answering yes to Qn. O	Sample: 10 years +, not inactive	Sample: 10 years and male, or female and not inactive (If inactive person is female, do not ask B18 and B19)	Sample: 10 years +, and ever worked (currently, or before) and currently available to work
Q: What is your occupation?	N: What is your occupation?	B18: What is this person's main occupation?	P25. What was [the respondent's] main occupation during the last 7 days or the last time he/she worked? P26. What is [the respondent's] status in the occupation? (Employer, self employed, public sector, private sector, family farm/business, other)
R: What is your industry of work?	O: What is your industry of work?	B19: What is this person's main trade or business (industry)?	P27. What is the main product, service or activity of [the respondent's] place of work?

A.3 Population density and urbanization variables

We digitized population data from the 1945, and 1966 Nyalasand Census and the 1977 Malawi Census. These data were reported at district level, sometimes separately for men and women in different age groups. We combined these data with district data from the 1987, 1998 and 2008 Census, and constructed poopulation densities at district level using the area of the district. We also measure population totals over, for men and women separately, and the share of population in urban areas within the district.

A.4 Migrants at district-level

In Census 1977, the total number of men who report ever migrating from Malawi is reported at district level (Census 1977, Table 4.8) while the share of miners who returned between 1966 and 1977 is reported in national aggregate data (Census 1977, Table 4.11). To construct district-specific numbers of migrants returning between 1966 and 1977, we multiplied the share of workers who had returned to Malawi in the last 10 years (out of all ever migrants who returned to Malawi) by the total men in each district who had ever migrated for work by 1977. Because of the labor ban, all migrants had returned to Malawi by 1975 and so would have been present in the 1977 Census.

Figure 1 is constructed using national labor migration totals from a variety of sources including: Chirwa (1992) for years 1950-1958; Lipton (1980) for years 1959-1994; Crush, Jeeves and Yudelman (1991) and various years of TEBA (The Employment Bureau of Africa) Annual Reports for the remainder.

A.5 Baseline district covariates from Census data

Historical literacy rates: we digitized data on the district-specific share of adults who were literate from the Report on the Census of 1931 (Nyasaland Protectorate, Table 6)

Share of married men and women in 1977: we digitized data on the share of men and women married from Census 1977 (Table 2.1)

Share of men and women with no cash incomes in 1966: we digitized the district-specific rates of men and women earning no cash income from the Malawi 1966 Population Census Final Report (Malawi National Statistics Office, Zomba: Table 21)

A.6 Physical and human capital investments and asset ownership

We measured investments in different ways, based on what information was available in at least two datasets. We used data from the 1977, 1987, 1998 and 2008 Census data as described above, and from the 1968/9 National Sample Survey of Agriculture (NSSA). The NSSA data were collected from around 5,000 households, and was designed to be representative at district-level. The part of the 1968 survey that collected these data was an income and expenditure-type survey.

Table A2: **Economic Activity Status Questions in Malawi National Census**

Census 1977	Census 1987	Census 1998	Census 2008
Sample: 10 years and older	Sample: 10 years and over	Sample: 10 years and over	Sample: Non-visitors, 6 years and over
O: Did you work last week (Y/N)?	M: Activity status in last seven days? Active: Mlimi, Employee, Family business worker, Self employed, Employer, Unemployed (Worked before and seeking/not seeking work, or never worked and seeking/not seeking work). Inactive: Home worker, Student, Dependent, Independent, Other	B17: What was X doing in the last 7 days? Active: Mlimi, Employee, Family business worker, Self-employed, Employer, Unemployed (worked before, seeking/not seeking work, never worked before/seeking work). Inactive: Non-worker: never worked before and not seeking work, homeworker, student, other	P20. Aside from his/her own housework, did X work during the last 7 days? (Y/N)
			P21. Why did X not work during the last 7 days? Inactive: Homeworker, Non-worker (never worked), On leave with job, Retired, Student, Other
P: What was your activity? Active: Mlimi, Employee, Family business worker, Self-employed, Employer, Unemployed (worked before and seeking/not seeking work; never worked before and seeking/not seeking work). Inactive: Home worker, student, dependent, independent, other			P22. Did X do one of the following activities during the last 7 days? Active: Farming/rearing animals/fishing, Production/services/selling, House worker at someone's house, Homeworker at own house, nothing
			P23. Is S available to work? (Y/N) P24. Has X been seeking work during the last 7 days? (N, Y-first job, Y-new job)

Radios: The share of households in the district owning at least one radio exists in all years.

Piped water: The share of households in the district with piped water/indoor plumbing was available in all years except the 1968 data.

Bike ownership: The share of households with at least one bike was available in 1968, 1987, 1998 and 2008.

Durable housing: The share of households that lived in houses with a durable wall, durable roof, or both durable wall and roof was available in 1968 and in 1987.

Agricultural tools: The share of households with at least one panga, at least one hoe, or at least one type of livestock.

B Administrative data

To measure flows of migrant capital, and describe the composition of miners, we collected and digitized data from the National Archives in Malawi and from The Employment Bureau of Africa (TEBA) archives in South Africa, from the Malawian National archives and Rhodes House Library at Oxford University in the U.K.

Migrant capital: Our data record the monthly flows of migrant money from South Africa to specific districts in Malawi, for the period October 1966 to November 1975. These records come from documents entitled "Attestation and Despatch Returns to the Ministry of Labour", found in Malawi's National Archives in Zomba and in the TEBA Archives at the University of Johannesburg, South Africa. To construct a time series of the flows in a consistent currency unit, we converted GBP to the Malawi Kwacha using an exchange rate of 2:1, the official exchange rate at the time the Malawi currency was adopted in 1971. Capital flows were recorded in each of three categories: deferred pay, voluntary remittances, and deposits. Our analysis uses only the deferred pay amounts that were set by contract. These flows make up 89% of the total flows of money over the period.

C Other Geographic covariates

Area: geographic area for 24 districts was calculated in ArcGIS

High Malaria Area indicator: we computed altitude for each point on the Malawian grid map using data from the national map seamless server `http://seamless.usgs.gov/index.php` and the Viewshed tool in ArcGIS. We aggregated these measures to district level. Then we defined areas of high, medium or low malaria susceptibility based on standard measures of altitude: high malaria areas (altitude below 650m), medium malaria areas (altitudes be-

tween 650m and 1100m) and low malaria areas (altitudes over 1100m)

Estate indicator: We identified which districts contained a large tea or tobacco plantation using information in Christiansen (1984). The FAO's crop suitability index measuring whether a district is highly suitable for tobacco or tea production significantly predicts this estate district indicator

D Household Income and Expenditure Surveys

We used micro-level data from the Malawi Integrated Household Income and Expenditure Survey 1997/1998 to characterize the capital intensity of farm and non-farm activities in Malawi and to create a measure of agricultural productivity (value-added of labor in agriculture; see Gollin et al 2013 for detailed description of this measure).

To measure value added in agriculture, we computed the total value of self-employment output in agriculture, the value of labor income from agricultural work outside of the household and any interest on land rented out. For self-employment output on farms, we valued all crops produced at home, whether for market or home consumption. We valued home produced goods at local or national market prices, whichever was available for the specific crop and unit harvested. We do the same for livestock sold. From this agricultural income total at the household level, we subtracted out the value of non-labor inputs (rented land, fertilizer, seeds) and hired-in labor inputs into agricultural production.

To measure value added in non-farm activities at the household level, we added revenues from non-agricultural household businesses, wage and salary income from non-farm work outside of the home, and subtracted out the costs of intermediate inputs used in self-employment. Almost no households report renting out capital equipment for non-farm use.

Measuring labor used in each sector is tricky, mainly because workers do not have full-time jobs in either sector. We computed effective units of labor used in agriculture, and in non-farm work at household level, by counting up the number of workers reporting their primary occupation is in agriculture as a farmer, or not, and weighting these workers by the average number of weeks worked in the last year. We also included women reporting home production as farm workers in the household. Following the macro literature, we included measures of workers who are currently unemployed but who report sector of work and weeks of work per year.

To create value added of labor measures, we divided household value added in each sector by the total number of workers in the household in each sector.

Figure 1: Share of adult men working abroad on South African mines by country, 1920-1990

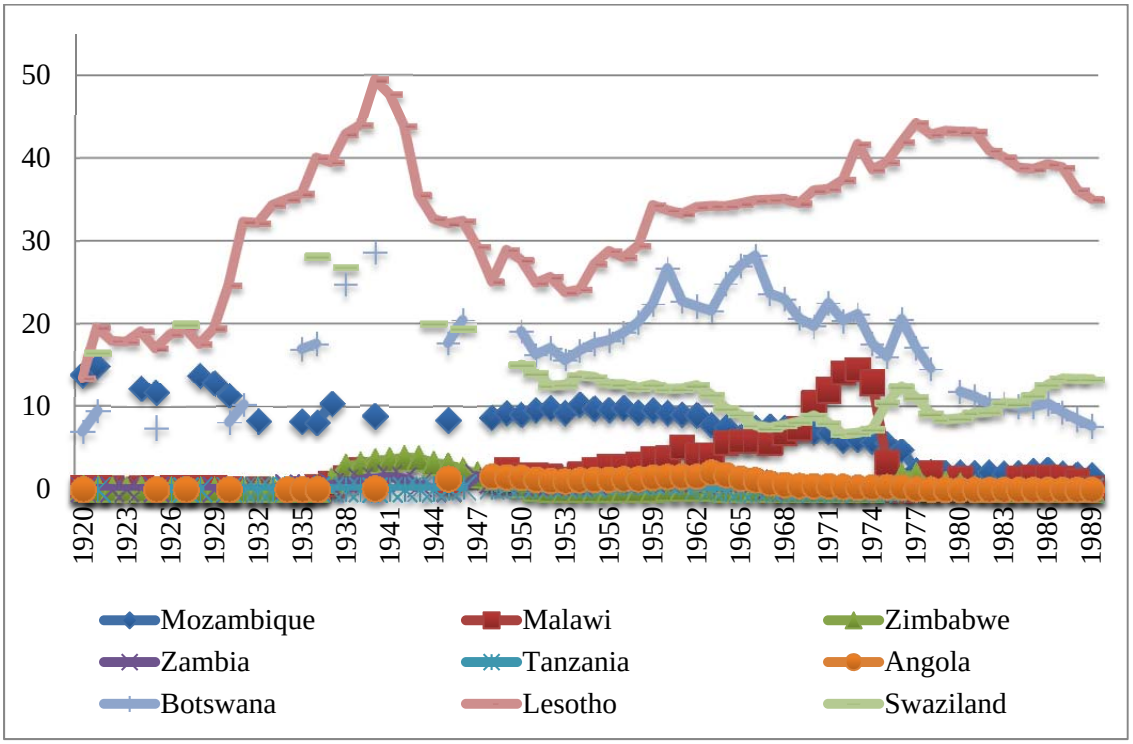


Figure shows percent of working age men employed on South African gold mines. Data on migrant workers from Crush, Jeeves and Yudelman 1991. Data on working age male population from http://www.populstat.info/.

Figure 2a: Top Five Industrial Classifications in Non-Farm Sector, 1998

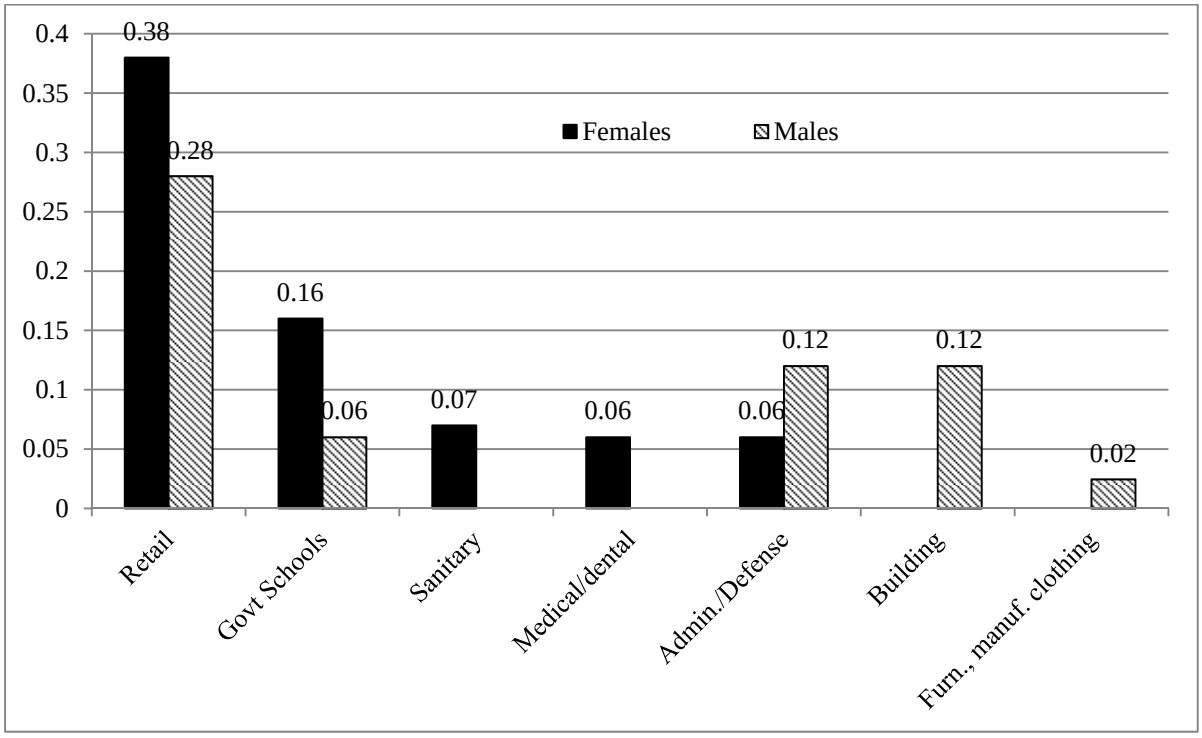
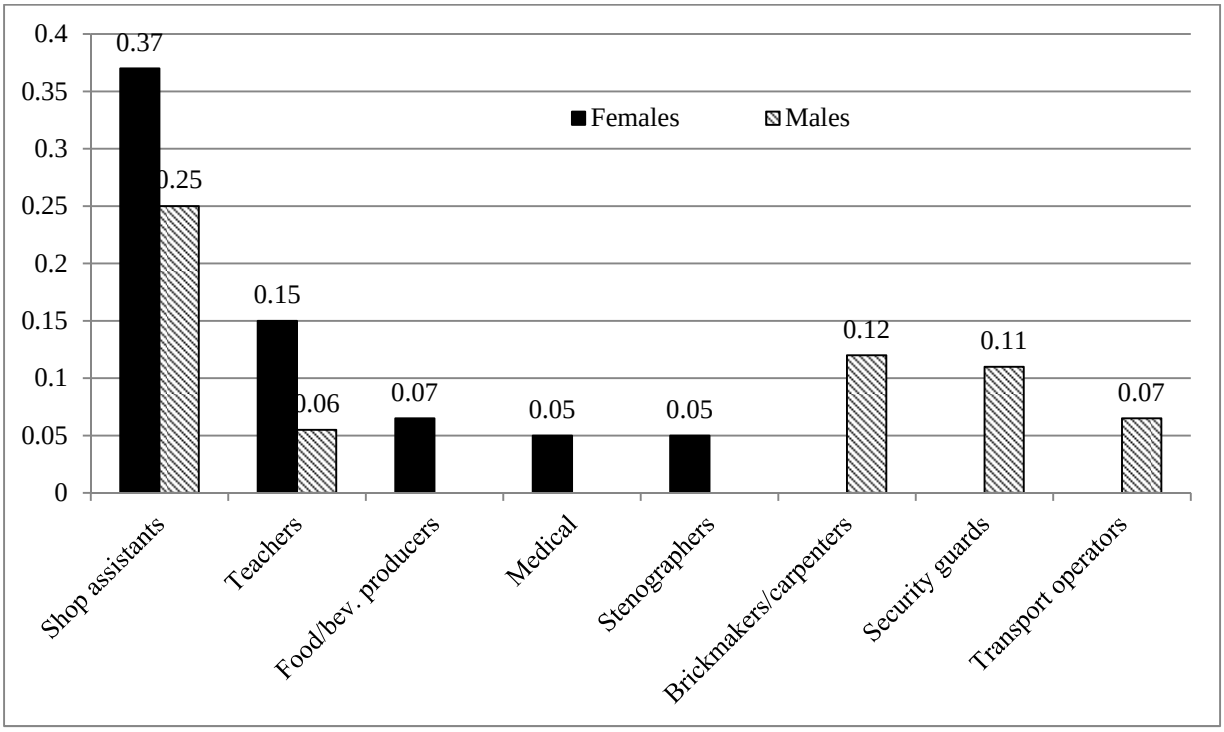
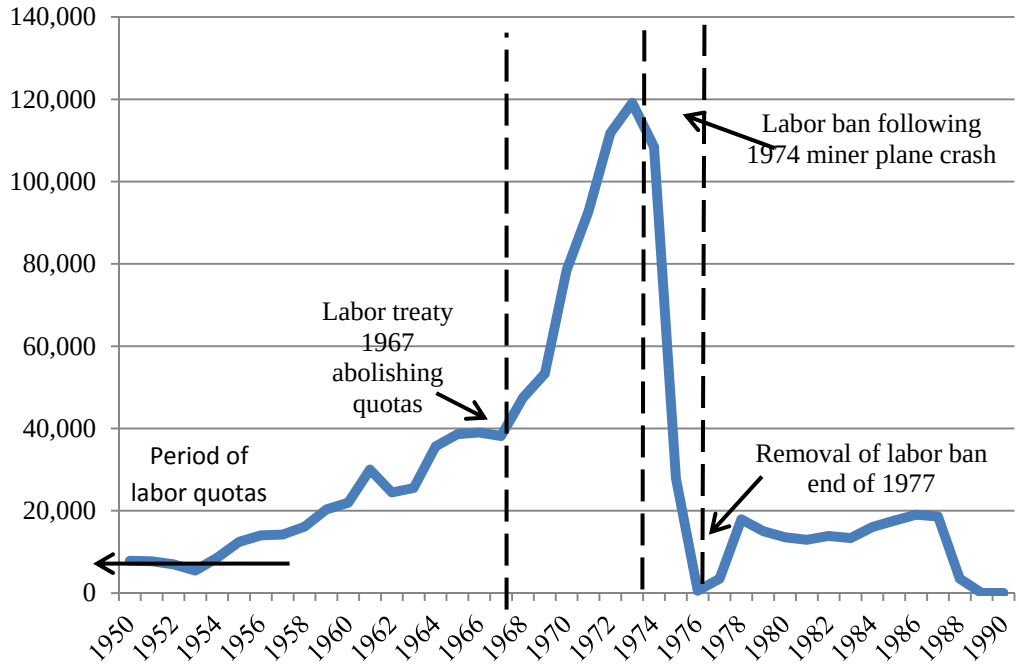


Figure 2b: Top Five Occupation Classifications in Non-Farm Sector, 1998



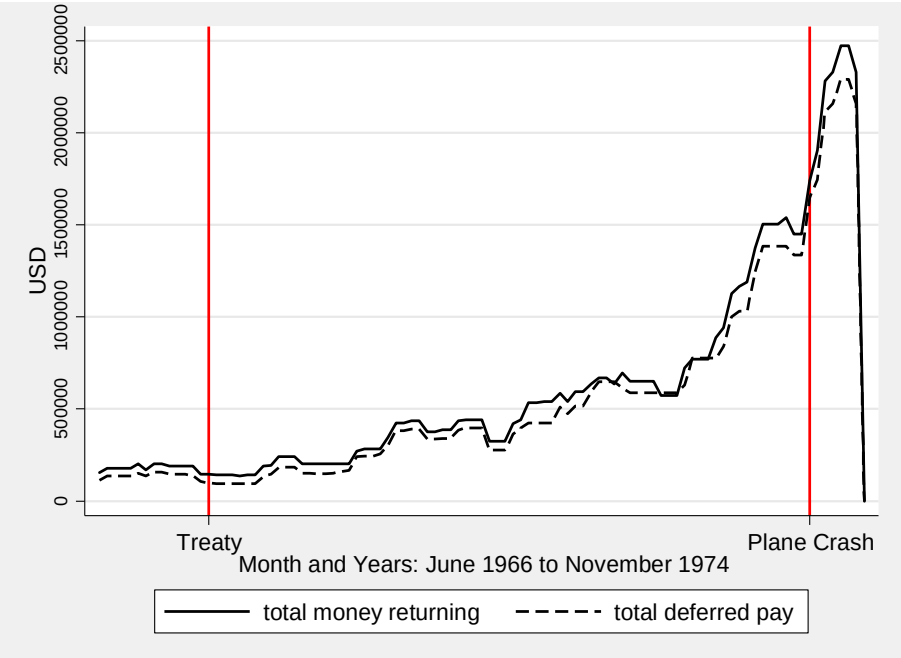
Notes: Figures indicate the share of men and women employed in non-farm industries (top figure) or non-farm occupations (bottom figure) using two digit industry and occupation classifications in the 1998 Census.

Figure 3a: Annual employment of Malawian miners on South African mines, 1950-1994



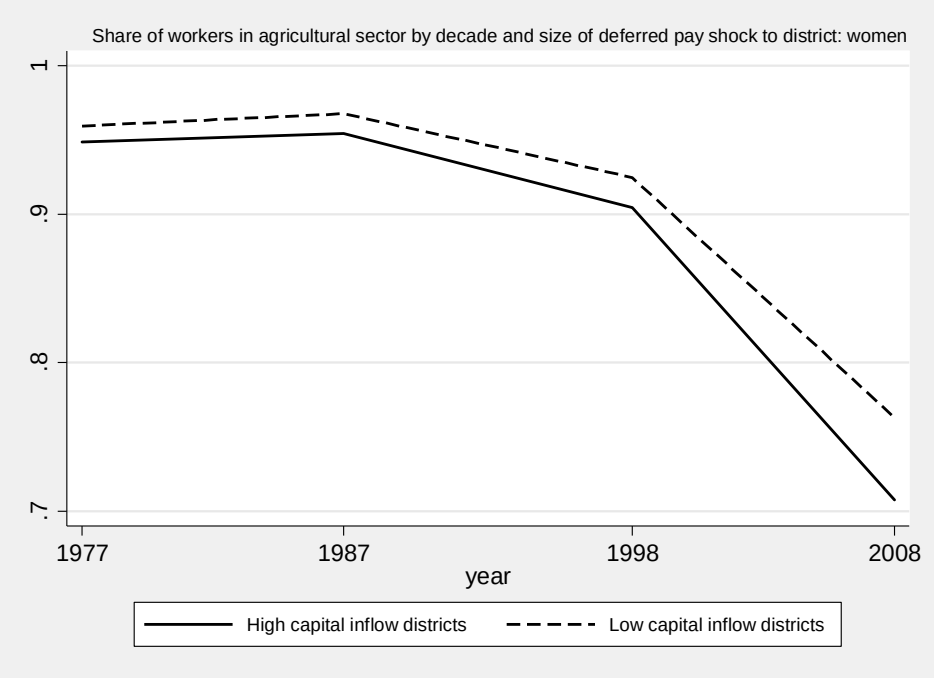
Source: Dinkelman and Mariotti (2016). Figure 2 shows number of workers contracted by Wenela to work on South African mines in each year. The three dotted lines represent (from left to right) the abolition of labor quotas in August 1967, the moratorium on migration after the April 1974 Malawian plane crash and the legal resumption of mine migration in 1978.

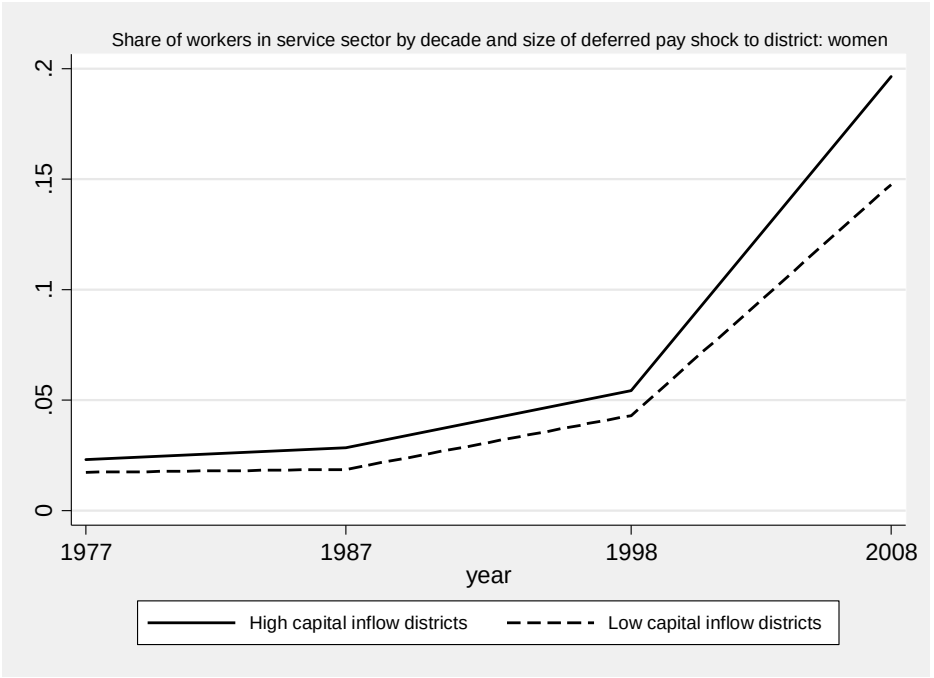
Figure 3b: Migrant capital flows over time, 1966-1975



Source: Archival material collected by the authors

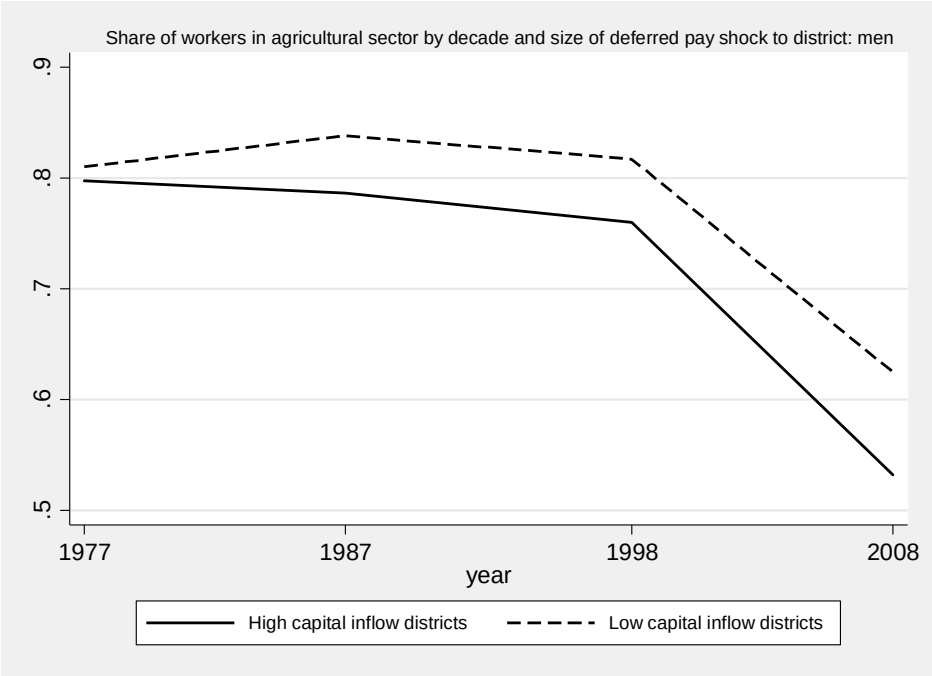
Figure 4: Sectoral shifts in the labor market: Women

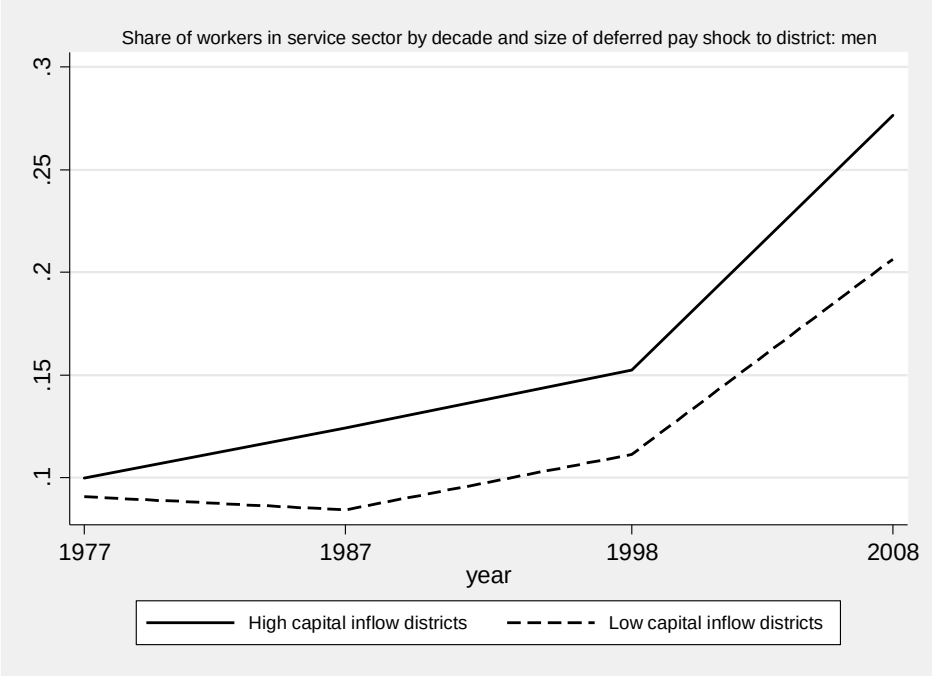




Notes: Share of employed women working in agricultural (top) or services (bottom) sectors over time and by type of district. High capital inflow districts are the districts receiving above median levels of migrant deferred pay before 1977.Low capital inflow districts are those receiving below median levels of deferred pay. Means are weighted using Census weights.

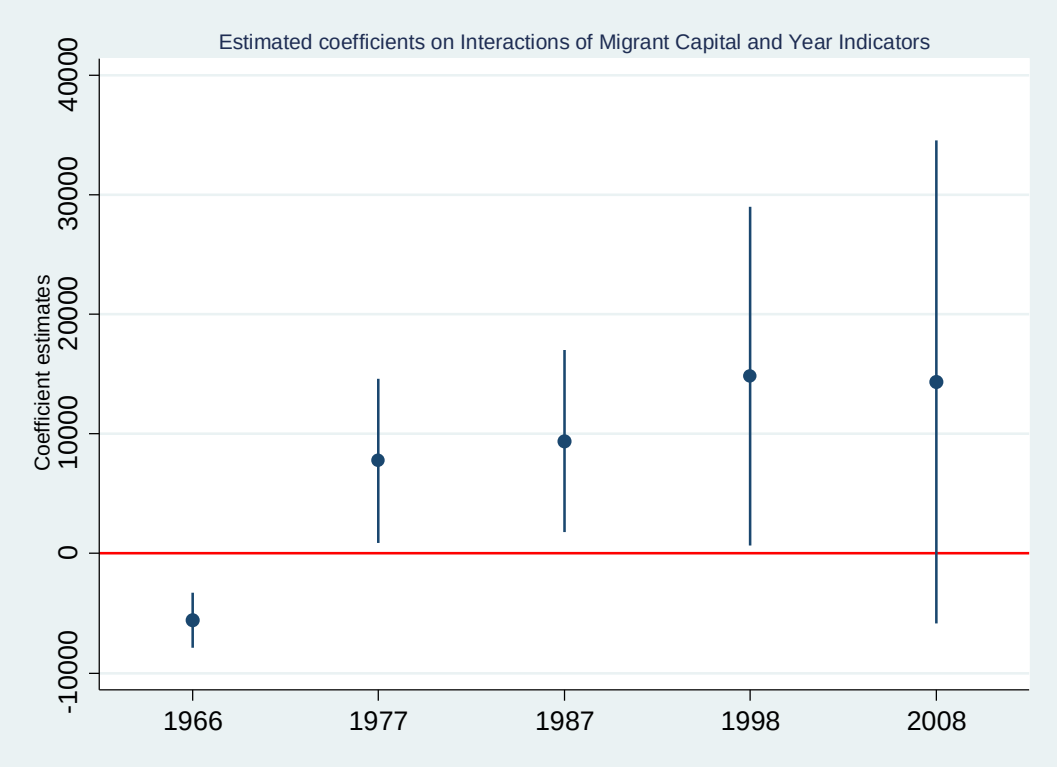
Figure 5: Sectoral shifts in the labor market: Men





Notes: Share of male workers in agricultural (top) or services (bottom) sectors over time and by type of district. High capital inflow districts are the districts receiving above median levels of migrant deferred pay before 1977. Low capital inflow districts are those receiving below median levels of deferred pay. Means are weighted using Census weights.

Figure 6: Checking for pre-trends in population across high and low migrant capital districts



Notes: Figure plots coefficients estimated for equation (1) estimated using the total population of the district as outcome. The points are coefficients on the interaction of Census year dummies with the district-level migrant capital shock. Base year is 1945.

Table 1: Changes in sector of work in Malawi over time

	Employment shares by decade			
	1977	**1987**	**1998**	**2008**
Sector of work (Industry): Women				
Agriculture	0.943	0.941	0.888	0.695
Manufacturing	0.016	0.013	0.012	0.038
Services	0.028	0.037	0.067	0.210
Industrial concentration index	0.893	0.893	0.805	0.538
Sector of work (Industry): Men				
Agriculture	0.760	0.761	0.731	0.532
Manufacturing	0.093	0.077	0.074	0.133
Services	0.120	0.135	0.171	0.278
Industrial concentration index	0.618	0.622	0.589	0.357

Population-weighted shares of adults in each sector of work and employment category from Census data. Information on the industrial ector of work for the economically active population (workers and unemployed) 10 years and older are collapsed to district-gender cells. 24 observations per cell. Home workers are excluded from these definitions. Industrial Concentration Index is a Herfindahl index of sector of work; larger values imply more concentration of work sector in the district. Data appendix contains details of dataset construction. Totals do not sum to 1 because of residual "not stated" categories for industry of work.

Table 2: Capital and labor inputs in farm and non-farm production in Malawi

Annual means, 1998 USD	**Working capital**	**Physical capital**	**Land capital**	**Total capital**	**Revenue**	**Effective Labor**	**Value Added of Labor**
	Non-labor inputs excluding land and capital equipment	*Equipment*	*In production*	*Working capital + physical capital + land*	*Sales + home production valued at market prices*	*Num. Workers*Share of year working*	*Net value added/Effective labor*
All Farm Households N=9,280	20	13	125	158	97	0.44	403
Households w/ non-farm business N=1,964	172	139	na/a	311	540	0.77	455
Ratio: Non-farm/farms	8.6	10.4		2.0	5.6	1.8	1.1

Data are from the 1997/1998 Malawi Household Integrated Income and Expenditure Survey (HIES). Unit of observation is the household, means are weighted, values (except for effective labor units) are annual means and standard deviations in USD. Statistics in the top panel are calculated over all rural households; in the bottom panel, the sample is restricted to rural households running at least one household business with only one worker (the majority of household businesses are single-operator). Working capital includes (e.g.) seeds and fertilizers, or stock for household retail businesses. Physical capital equipment includes (for example): hoes, sickles, pangas and axes for farming activities; bicycles and pounding mills for services. Land is only valued for farm operations. Annual revenues include the value of home produced goods and services. *Net value added measure excludes the value of land. See data appendix for further discussion of how measures of value added were created.

Table 3: Summary statistics, district-level data

	Mean	s.d.	min	max	N
Components of migration shock					
Number of adult men (aged 15-64) in the district in 1977	54,809	39,418	13,057	180,466	24
Number of adult men ever been abroad by 1977~	19,557	15,421	4,232	75,324	24
Δ number of migrants, 1966-1977	13,642	10,667	2,816	50,121	24
Total deferred pay per district 1966-1975, Millions of USD	2.25	3.53	0	16.29	24
Total deferred miner pay per person in district 1966-1977, USD	24.04	55.40	0	275.68	24
Total deferred miner pay per migrant from district 1966-1977, USD	129.41	177.76	0	908.46	24
District-level descriptives at baseline					
Northern Region	0.21	0.41	0	1	24
Central Region	0.38	0.49	0	1	24
Southern Region	0.42	0.50	0	1	24
Population, 1945	71,262	60,353	5,919	230,891	24
Population density, 1945	30.61	26.61	5.10	109.05	24
Share of youth literate in English and vernacular, 1945	0.08	0.04	0.03	0.14	24
Altitude: high malaria area=1	0.28	0.35	0	1	24
Share of districts with any agricultural estate	0.46	0.51	0	1	24
Share of men earning no cash income in 1966	0.37	0.10	0.22	0.59	24
Share of women earning no cash income in 1966	0.48	0.14	0.28	0.72	24

Data for the first set of outcomes are district-level data collected from administrative records and from Census 1977. Data for the second set of outcomes comes from 1945 Census data 1and from geographic files for Malawi. Agricultural estate is a dummy variable indicating whether a district contains any cash crop estates (e.g. for tobacco or sugar). Raw means (unweighted).

Table 4: Predicting spatial variation in deferred pay flows at district level

	Raw deferred pay flow, 1966-1975		Residual deferred pay flow, 1966-1975	
Indicator for high malaria area	-596.07	-283.529	-554.674	-258.17
	(2.36)*	(1.510)	(2.14)*	(1.260)
Log population density 1945	-166.163	-197.752	-151.316	-181.284
	(0.880)	(1.160)	(0.790)	(1.050)
Share of young adults literate in 1945	-3159.049	221.949	-2904.519	302.984
	(1.470)	(0.140)	(1.300)	(0.160)
Indicator for estate area	-247.025	-232.157	-251.203	-237.098
	(1.430)	(1.570)	(1.450)	(1.540)
Share of working men with no cash wage 1966	-4037.561	-3892.465	-4066.856	-3929.205
	(1.240)	(1.340)	(1.240)	(1.330)
Share of working women with no cash wage 1966	2816.897	3162.787	2727.988	3056.129
	(1.100)	(1.360)	(1.060)	(1.300)
Central region indicator	119.507	286.744	-70.311	88.344
	(0.510)	(1.170)	(0.320)	(0.350)
Southern region indicator	5.169	184.219	-181.282	-11.42
	(0.020)	(0.750)	(0.860)	(0.050)
Number of migrants, 1966-1975		0.018		0.017
		(2.16)*		(2.040)
Controlling for month-year variation	N	N	Y	Y
Observations	24	24	24	24
R-squared	0.47	0.63	0.41	0.56

Standard errors clustered at the district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample t-distribution. Unit of observation is the district. Outcome in columns 3 and 4 is the residual from a regression of district-month-year flows of deferred pay on year and month dummies, added up over months and years to district-level. R2 from this initial regression is 0.0004.

Table 5: Long run impacts of migrant capital inflows on employment shares in different sectors

	Share in Agriculture		Share in Manufacturing		Share in Services		Industrial concentration	
Panel A: Women	*Mean: 0.88*		*Mean: 0.02*		*Mean: 0.08*		*Mean: 0.8*	
Millions of USD*Three decades post	-0.0157***	-0.00851***	0.00151**	0.00153*	0.0168***	0.00874***	-0.00663**	0.0026
	(0.002)	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)	(0.003)	(0.003)
Millions of USD*Two decades post	-0.0126***	-0.00874***	0.0007	0.0008	0.00922***	0.00366**	-0.0135***	-0.00962***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.004)	(0.003)
Millions of USD*One decade post	-0.00359*	-0.0011	0.0006	0.000908**	0.0027	-0.0008	-0.00538*	-0.00347**
	(0.002)	(0.001)	(0.000)	(0.000)	(0.002)	(0.001)	(0.003)	(0.002)
Thousands of migrants*Three decades post		-0.00121**		-0.0002		0.00171***		-0.0008
		(0.000)		(0.000)		(0.000)		(0.001)
Thousands of migrants*Two decades post		-0.00179**		-0.00002		0.00268***		-0.0017
		(0.001)		(0.000)		(0.001)		(0.001)
Thousands of migrants*One decade post		-0.00353***		-0.00001		0.00391***		-0.00459***
		(0.001)		(0.000)		(0.001)		(0.001)
P value for Joint F on Migrant capital	0.00	0.00	0.05	0.04	0.00	0.00	0.02	0.00
P value for Joint F on Number of migrants		0.00		0.56		0.00		0.00
Panel B: Men	*Mean: 0.73*		*Mean: 0.09*		*Mean: 0.15*		*Mean: 0.58*	
Millions of USD*Three decades post	-0.00590**	-0.00055	0.0000	-0.0002	0.00784***	0.0015	0.0016	0.0011
	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.004)	(0.005)
Millions of USD*Two decades post	-0.0116***	-0.00745***	0.0019	0.0011	0.01000***	0.00575***	-0.0105***	-0.00914**
	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.001)	(0.003)	(0.004)
Millions of USD*One decade post	-0.00665***	-0.00446***	0.0004	0.00035	0.00380**	0.0010	-0.00854***	-0.00780***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Thousands of migrants*Three decades post		-0.00128**		-0.00001		0.00171***		-0.0007
		(0.001)		(0.000)		(0.000)		(0.001)
Thousands of migrants*Two decades post		-0.00236**		0.0007		0.00232***		-0.0013
		(0.001)		(0.001)		(0.001)		(0.001)
Thousands of migrants*One decade post		-0.00285***		0.0001		0.00342***		0.0001
		(0.001)		(0.001)		(0.001)		(0.001)
P value for Joint F on Migrant capital	0.00	0.00	0.23	0.45	0.00	0.00	0.00	0.00
P value for Joint F on Number of migrants		0.04		0.56		0.00		0.35

Standard errors clustered at district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample *t* -distribution. Migrant capital is the total deferred pay returning to each district by 1975, in millions of USD. Data are from Census 1977, 1987 (one decade post), 1998 (two decades post) and 2008 (three decades post). Unit of observation is the district-gender cell. Total districts=24. Total observations in each regression is 96. All regressions include district and year fixed effects and interactions of a linear trend term with baseline variables (adult literacy in 1945, population density in 1945, a malaria dummy, share of men and women married in 1966, share of men and women not earning any cash income in 1966, two region dummies). Industrial concentration is a Herfindahl index measuring how concentrated work is in any one sector. Regressions are population weighted.

Table 6: Long run impacts of migrant capital inflows on employment shares in different sectors
Capital shocks triggered by plane crash

	Share in Agriculture	Share in Manufacturing	Share in Services	Industrial concentration
Panel A: Women	*Mean: 0.88*	*Mean: 0.02*	*Mean: 0.08*	*Mean: 0.8*
Millions of USD post crash*Three decades post	-0.0304***	0.005	0.0319***	0.012
	(0.007)	(0.004)	(0.009)	(0.009)
Millions of USD post crash*Two decades post	-0.0309***	0.002	0.0130*	-0.0320***
	(0.007)	(0.003)	(0.008)	(0.010)
Millions of USD post crash*One decade post	-0.003	0.003	-0.003	-0.0099*
	(0.005)	(0.002)	(0.005)	(0.006)
P value: Joint test, Migrant capital	0.00	0.01	0.00	0.00
Panel B: Men	*Mean: 0.73*	*Mean: 0.09*	*Mean: 0.15*	*Mean: 0.58*
Millions of USD post crash*Three decades post	0.000	-0.002	0.005	0.007
	(0.016)	(0.009)	(0.004)	(0.027)
Millions of USD post crash*Two decades post	-0.0248**	0.003	0.0197***	-0.031
	(0.012)	(0.006)	(0.004)	(0.019)
Millions of USD post crash*One decade post	-0.0141**	0.000	0.003	-0.0251***
	(0.006)	(0.003)	(0.002)	(0.009)
P value for Joint F on Migrant capital	0.000	0.572	0.000	0.000

Standard errors clustered at district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample *t* -distribution. Migrant capital is the total deferred pay returning to each district between April 1974 and November 1975, in millions of USD. The average of this variable is 0.6. Data are from Census 1977, 1987 (one decade post), 1998 (two decades post) and 2008 (three decades post). Unit of observation is the district-gender cell. Total districts=24. Total observations in each regression is 96. All regressions include district and year fixed effects and interactions of a linear trend term with total number of migrants, baseline variables (adult literacy in 1945, population density in 1945, a malaria dummy, share of men and women married in 1966, share of men and women not earning any cash income in 1966, two region dummies). Industrial concentration is a Herfindahl index measuring how concentrated work is in any one sector. Regressions are population weighted.

Table 7: Long run impacts of migrant capital inflows on employment shares in non-farm subsectors

	General manufacturing	Construction	General services	Retail	Transport or communications
Panel A: Women	*Mean: 0.0139*	*Mean: 0.005*	*Mean: 0.0288*	*Mean: 0.0463*	*Mean: 0.0011*
Millions of USD*Three decades post	0.0004	0.00107***	0.00189**	0.00676***	0.0001***
	(0.001)	(0.000)	(0.001)	(0.002)	(0.000)
Millions of USD*Two decades post	0.00009	0.000693**	0.0004	0.00316***	0.0001***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)
Millions of USD*One decade post	0.0004	0.000481**	-0.00014	-0.0008	0.0002***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
P value for Joint F on Migrant capital	0.13	0.04	0.00	0.00	0.00
P value for Joint F on Number of migrants	0.09	0.42	0.00	0.00	0.00
Panel B: Men	*Mean: 0.049*	*Mean: 0.036*	*Mean: 0.074*	*Mean: 0.065*	*Mean: 0.013*
Millions of USD*Three decades post	-0.00374*	0.00379***	-0.00269***	0.00563***	-0.00143***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)
Millions of USD*Two decades post	-0.00425***	0.00547***	0.0005	0.00693***	-0.00171***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Millions of USD*One decade post	-0.00192**	0.00216***	-0.0003	0.00156***	-0.0003
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
P value for Joint F on Migrant capital	0.00	0.00	0.00	0.00	0.00
P value for Joint F on Number of migrants	0.01	0.01	0.00	0.00	0.00

Standard errors clustered at district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample t-distribution. Migrant money is the total deferred pay returning to each district by 1975, in millions of USD. Data are from Census 1977, 1987, 1998 and 2008. Unit of observation is the district-gender cell. Total districts=24. Total observations in each regression is 96. All regressions include district and year fixed effects and interactions of a linear trend term with baseline variables (adult literacy in 1945, population density in 1945, a malaria dummy, share of men and women married in 1966, share of men and women not earning any cash income in 1966, two region dummies).

Table 8: Long run impacts of migrant capital inflows on type of employment

	Share of workers in all sectors in:			Share of all service sector workers in:		
	Self-employment	**Family business/ family farm**	**Wage work**	**Self-employment**	**Family business**	**Wage work**
Panel A: Women	*Mean: 0.876*	*Mean: 0.0277*	*Mean: 0.0463*	*Mean: 0.0732*	*Mean: 0.0418*	*Mean: 0.869*
Millions of USD*Three decades post	-0.005	0.00591***	-0.0004	0.001	0.00670**	-0.00964*
	(0.003)	(0.001)	(0.001)	(0.004)	(0.003)	(0.005)
Millions of USD*Two decades post	-0.0115***	0.00632***	0.00133*	0.002	0.00275*	-0.00910***
	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
P value for Joint F on Migrant capital	0.00	0.00	0.00	0.22	0.02	0.00
P value for Joint F on Number of migrants	0.51	0.00	0.05	0.31	0.00	0.02
Panel B: Men	*Mean: 0.682*	*Mean: 0.0309*	*Mean: 0.219*	*Mean: 0.102*	*Mean: 0.0262*	*Mean: 0.859*
Millions of USD*Three decades post	0.005	0.00225**	-0.003	0.00281*	0.002	-0.00460***
	(0.005)	(0.001)	(0.005)	(0.001)	(0.002)	(0.002)
Millions of USD*Two decades post	-0.003	0.00209***	0.001	0.00201*	-0.001	-0.00215*
	(0.003)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)
P value for Joint F on Migrant capital	0.00	0.01	0.05	0.15	0.00	0.02
P value for Joint F on Number of migrants	0.59	0.02	0.18	0.71	0.00	0.19
All other controls and district FE included?	Y	Y	Y	Y	Y	Y
N	72	72	72	72	72	72

Standard errors clustered at district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample t-distribution. Migrant money is the total deferred pay returning to each district by 1975, in millions of USD. Data are from Census 1987, 1998 and 2008. Unit of observation is the district-gender cell. Total districts=24. Total observations in each regression is 72. All regressions include district and year fixed effects and interactions of a linear trend term with baseline variables (adult literacy in 1945, population density in 1945, a malaria dummy, share of men and women married in 1966, share of men and women not earning any cash income in 1966, two region dummies).

Table 9: Testing pre-trends and checking impacts on population growth and urbanization

	Ln population	Ln female population	Ln population under age 5	Ln population age 5 to 18	Ln population age 18 +	Share of urban population
Millions of USD*Three decades after	0.0425*	0.0334	0.046	0.024	0.031	0.00591**
	(0.023)	(0.021)	(0.030)	(0.029)	(0.028)	(0.003)
Millions of USD*Two decades after	0.0436*	0.0339*	0.044	0.029	0.032	0.00630**
	(0.022)	(0.019)	(0.030)	(0.027)	(0.026)	(0.003)
Millions of USD*One decade after	0.0343**	0.0237*	0.0432**	0.027	0.027	0.00464***
	(0.017)	(0.013)	(0.020)	(0.018)	(0.019)	(0.002)
Millions of USD*End of migration	0.0286**	0.0185	0.0415**	0.022	0.024	0.00408***
	(0.013)	(0.011)	(0.017)	(0.016)	(0.016)	(0.001)
Millions of USD*One decade before	-0.0292***	-0.0398***	-0.015	-0.0324**	-0.0294***	
	(0.004)	(0.004)	(0.009)	(0.012)	(0.010)	
N	144	144	144	144	144	120
R2	0.96	0.97	0.96	0.97	0.97	0.92
Mean	12.04	11.37	10.59	11.20	11.45	0.04
P value for Joint F on migrant capital interactions	0.30	0.10	0.02	0.26	0.65	0.00
P value for Joint F on migrant interactions	0.13	0.07	0.72	0.88	0.14	0.02

Standard errors clustered at the district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample t-distribution. Census data are from 1945, 1966, 1977, 1987, 1998 and 2008. Omitted category is Millions of USD*(Year=1945) for the first three outcomes; Millions of USD*(Year=1966) for the last outcome. Unit of observation is the district-year cell. Total districts=24. All regressions control for district and year fixed effects, interactions of baseline controls with year dummies, and interactions of number of migrants with year dummies. Regressions are not population-weighted. Urban share of the district not available in 1945.

Table 10: Checking for differential trends in internal migration across districts with varying capital shocks

	Inmigration rate per 1,000:		**Outmigration rate per 1,000:**		**Net migration rate per 1,000:**	
Definition	*Num inmigrants/current population*1000*		*Num. outmigrants/current population*1000*		*((Num. inmigrants-Num. outmigrants/total current population)*1,000*	
	Mean: 275		*Mean: 278*		*Mean: -3*	
Millions of USD*Three decades post	-18.52	-16.09	42.50	26.13	-61.02	-42.22
	(15.21)	(18.46)	(59.46)	(49.78)	(54.77)	(43.83)
Millions of USD*One decade post	-16.45	-19.34	79.72	87.36	-96.18	-106.70
	(18.10)	(30.05)	(85.84)	(109.30)	(79.60)	(93.70)
Millions of USD*End of migration	-13.35	-23.27	120.10	148.50	-133.40	-171.70
	(25.04)	(43.66)	(120.90)	(167.00)	(112.80)	(143.40)
Controls for number of migrants*Year	N	Y	N	Y	N	Y
N	91	91	91	71	71	71

Standard errors clustered at the district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample *t*-distribution. Data are from 1966, 1977, 1987 and 2008 Census. Unit of observation is the district-year, migration rates are computed for people of all ages in the district. All regressions control for district and year fixed effects, and for a trend term interacted with district controls: baseline adult literacy in 1945, population density in 1945, a malaria dummy, an agricultural estate dummy, the share of men and women not earning cash wages in 1966, and two region dummies. In the second column for each outcome, these district controls also include the number of migrants leaving between 1966 and 1977 interacted with trend. Regressions are not weighted.

Table 11: Long term impacts of migrant capital inflows on investments in physical capital

Share of households with (number of*)	**Hoe***	**Panga***	**Any Cattle**	**Bicycle**	**Oxcart**
	Mean: 1.82	*Mean: 0.48*	*Mean: 0.1*	*Mean: 0.37*	*Mean: 0.02*
Millions of USD*Three decades post (Year=2008)				-0.00447***	-0.008
				(0.002)	(0.009)
Millions of USD*Two decades post (Year=1998)	-0.010	0.006	0.007	0.000	-0.002
	(0.021)	(0.006)	(0.007)	(0.002)	(0.006)
Base year	1968	1968	1968	1987	1987
Years of data in sample	1968, 1997	1968, 1997	1968, 1997	1987, 1998, 2008	1987, 1998, 2008
N	46	46	46	69	69
P value of joint test on Migrant capital	n/a	n/a	n/a	0.20	0.08

Share of households with	**Durable walls**	**Durable roof**	**Durable roof and walls**	**Radio**	**Piped water**
	Mean: 0.39	*Mean: 0.13*	*Mean: 0.12*	*Mean: 0.28*	*Mean: 0.17*
Millions of USD*Three decades post (Year=2008)	-0.010	0.006	0.007	-0.00447***	-0.008
	(0.021)	(0.006)	(0.007)	(0.002)	(0.009)
Millions of USD*Two decades post (Year=1998)				-0.0004	-0.002
				(0.002)	(0.006)
Millions of USD*One decade post (Year=1987)	0.011	0.0136***	0.0134***	0.001	-0.002
	(0.012)	(0.003)	(0.004)	(0.001)	(0.004)
Millions of USD*Post (Year=1977)				0.00145*	
				(0.001)	
Base year	1968	1968	1968	1968	1977
Years of data in sample	1969, 1987, 2008	1969, 1987, 2008	1969, 1987, 2008	1969, 1977, 1987, 1998, 2008	1977, 1987, 1998, 2008
N	69	69	69	115	92
P value of joint test on Migrant capital	0.01	0.00	0.00	0.000	0.086

Standard errors clustered at the district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample *t*-distribution. Data are from different Census years for each outcome. Outcomes in Panel A: *Share of households with a bike, oxcart, or any cattle, and mean number of hoes and pangas per household in the district. Unit of observation is the district-year cell. Total districts with data in all Census years including 1966: 23. Other controls includes interactions of survey year dummies with total migrants between 1966 and 1977 and baseline district variables: adult literacy in 1945, population density in 1945, a malaria dummy, the share of men and women married in 1966, the share of men and women not earning any cash income in 1966, and region dummies. All regressions contain district fixed effects and year dummies. Regressions are not weighted.

Table 12: Long term impacts of migrant capital inflows on investment in education of the next generation

	Years of completed education	**Any primary schooling**
	Mean=2.55	*Mean=0.41*
Millions of USD*Early treated cohorts	0.101***	0.008**
	(0.030)	(0.003)
Millions of USD*Late treated cohorts	0.136***	0.011**
	(0.045)	(0.004)
Millions of USD*Posttreated cohorts	0.117***	0.009**
	(0.041)	(0.004)
Observations	480	480
R-squared	0.901	0.925
p value: Early treated interactions vs Late treated interactions	0.036	0.035
p value: Early treated interactions vs Posttreated interactions	0.227	0.387
p value: Late treated interactions vs Posttreated interactions	0.005	0.012

Standard errors clustered at the district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample t-distribution. Data are from Census 1977 and 1998. Unit of observation is the district-gender-cohort cell. Total districts in dataset: 24. *Early treated cohorts* are those age-eligible for primary school during 1967-1973; *Late treated cohorts* are those age-eligible for primary school during 1974-1977; *Posttreated cohorts* are those age-eligible for primary school 1977-1980. Other controls include interactions of cohort dummies with total migrants between 1966 and 1977, and baseline district variables interacted with trend terms: adult literacy in 1945, population density in 1945, a malaria dummy, and region dummies. All regressions contain district fixed effects and cohort and gender dummies. Regressions are not weighted.

Table 13: Are districts that received more migrant money wealthier 15 years later? Evidence from Malawi's 1992 Demograhic Health Survey

	Estimate beta (s.e.) [N] for Millions of USD received				
	Additional controls				
Outcome	None	+Migrants	+Region FE	+Baseline district controls	+Household characteristics
DHS Wealth index	0.0535***	0.0601***	0.0599***	0.0424***	0.0167**
	(0.010)	(0.006)	(0.005)	(0.008)	(0.007)
	[5323]	[5323]	[5323]	[5323]	[5287]
Count of assets	0.0680***	0.0739***	0.0765***	0.0637**	0.011
	(0.013)	(0.010)	(0.011)	(0.025)	(0.022)
	[5323]	[5323]	[5323]	[5323]	[5287]
Durable roof	0.0238***	0.0267***	0.0256***	0.0218***	0.0133***
	(0.005)	(0.003)	(0.002)	(0.004)	(0.003)
	[5323]	[5323]	[5323]	[5323]	[5287]
Durable floor	0.0193***	0.0219***	0.0221***	0.0184***	0.00950***
	(0.004)	(0.002)	(0.002)	(0.003)	(0.002)
	[5323]	[5323]	[5323]	[5323]	[5287]
Improved toilet	0.0141**	0.0190***	0.0196***	0.006	-0.001
	(0.005)	(0.002)	(0.004)	(0.008)	(0.008)
	[5323]	[5323]	[5323]	[5323]	[5287]
Improved water source	-0.003	-0.00409**	-0.00449*	0.001	-0.001
	(0.003)	(0.002)	(0.003)	(0.008)	(0.008)
	[5323]	[5323]	[5323]	[5323]	[5287]
Electricity	0.00637***	0.00689***	0.00682***	0.00340***	0.00005
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[5321]	[5321]	[5321]	[5321]	[5285]
Radio	0.0111**	0.0127***	0.0147***	0.0110*	0.00004
	(0.004)	(0.003)	(0.003)	(0.006)	(0.006)
	[5319]	[5319]	[5319]	[5319]	[5283]
Car	0.00248***	0.00232***	0.00227***	0.00243***	0.0007
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
	[5319]	[5319]	[5319]	[5319]	[5283]
Bicycle	-0.00628**	-0.00897***	-0.00846***	-0.008	-0.0148**
	(0.003)	(0.002)	(0.002)	(0.005)	(0.006)
	[5319]	[5319]	[5319]	[5319]	[5283]

Robust standard errors clustered at the district level. Each block of coefficients is estimated in a separate regression of the outcome variable (first column) on the amount of migrant capital returning to the district by 1975, and a series of controls variables: number of migrants 1966-1975, region fixed effects, baseline district level controls including population density in 1945, literacy rates, an indicator for estates in the district, a malaria risk indicator, the share of men and women married in 1966 and the share of men and women working for no cash wage in 1966. Household level controls include: average age and education of household head, whether the head is female, and the household size. Household level regressions are weighted using DHS sample weights. All outcomes are indicators except for number of assets (the count of asset measures per household) and the DHS wealth index, which is a composite index of household assets constructed using principal components analysis.

Robustness Appendix Table 1: Long run impacts of migrant capital inflows on share of workers in different sectors
Unweighted results

	Share in Agriculture		Share in Manufacturing		Share in Services		Industrial concentration	
Panel A: Women	*Mean: 0.88*		*Mean: 0.02*		*Mean: 0.07*		*Mean: 0.8*	
Millions of USD*Three decades post	-0.0143***	-0.0105***	0.0008	0.0015	0.0152***	0.0094**	-0.0045	0.0017
	(0.002)	(0.004)	(0.001)	(0.001)	(0.002)	(0.004)	(0.004)	(0.004)
Millions of USD*Two decades post	-0.0112***	-0.0113***	-0.0001	0.0012	0.0083***	0.0045	-0.0104**	-0.0128***
	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)	(0.003)	(0.004)	(0.003)
Millions of USD*One decade post	-0.0039**	-0.0019	0.0003	0.0011*	0.0027	-0.0007	-0.0057**	-0.0045**
	(0.002)	(0.002)	(0)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
P value for Joint F on Migrant capital	0.00	0.00	0.23	0.16	0.00	0.00	0.03	0.00
P value for Joint F on Number of migrants	1.00	0.11	1.00	0.20	1.00	0.32	1.00	0.00
Panel B: Men	*Mean: 0.73*		*Mean: 0.09*		*Mean: 0.15*		*Mean: 0.58*	
Millions of USD*Three decades post	-0.0028	0.0063	-0.0010	-0.0034	0.0054***	-0.0024	0.0045	0.0113
	(0.004)	(0.006)	(0.002)	(0.004)	(0.002)	(0.002)	(0.005)	(0.008)
Millions of USD*Two decades post	-0.0072**	-0.0047	0.0002	-0.0001	0.0072***	0.0041**	-0.0046	-0.0045
	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.006)
Millions of USD*One decade post	-0.0058***	-0.0030	0.0001	-0.0003	0.0030***	0.0000	-0.0072**	-0.0054
	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.003)	(0.003)
P value for Joint F on Migrant capital	0.03	0.00	0.81	0.09	0.00	0.00	0.00	0.00
P value for Joint F on Number of migrants	1.00	0.10	1.00	0.54	1.00	0.00	1.00	0.21
N	96	96	96	96	96	96	96	96

Standard errors clustered at district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample *t* -distribution. Migrant capital is the total deferred pay returning to each district by 1975, in millions of USD. Data are from Census 1977, 1987 (one decade post), 1998 (two decades post) and 2008 (three decades post). Unit of observation is the district-gender cell. Total districts=24. Total observations in each regression is 92; Lilongwe is omitted. All regressions include district and year fixed effects and interactions of a linear trend term with baseline variables (adult literacy in 1945, population density in 1945, a malaria dummy, share of men and women married in 1966, share of men and women not earning any cash income in 1966, two region dummies). Industrial concentration is a Herfindahl index measuring how concentrated work is in any one sector. No population weights included

Robustness Appendix Table 2: Long run impacts of migrant capital inflows on share of workers in different sectors
[Wild cluster bootstrapped standard errors]

	Share in Agriculture		Share in Manufacturing		Share in Services		Industrial concentration	
Panel A: Women	*Mean: 0.88*		*Mean: 0.02*		*Mean: 0.08*		*Mean: 0.8*	
Millions of USD*Three decades post	-0.0155***	-0.0095***	0.001	0.001	0.0164***	0.0099***	-0.0064*	0.003
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)	(0.004)	(0.004)
	[0.004]***	[0.004]***	[0.12]	[0.471]	[0]***	[0]***	[0.248]	[0.339]
Millions of USD*Two decades post	-0.0121***	-0.0095***	0.000	0.000	0.0093***	0.0046**	-0.0118***	-0.0093***
	(0.002)	(0.002)	0.000	(0.001)	(0.002)	(0.002)	(0.004)	(0.003)
	[0.004]***	[0.946]	[0.072]*	[0]	[0.004]***	[0.02]**	[0]***	[0]***
Millions of USD*One decade post	-0.0043**	-0.002	0.000	0.0007*	0.0033*	0.000	-0.0062**	-0.0038**
	(0.002)	(0.001)	0.000	0.000	(0.002)	(0.001)	(0.002)	(0.002)
	[0.591]	[0.459]	[0]**	[0.315]	[0.004]**	[0.008]***	[0]***	[0]***
Panel B: Men	*Mean: 0.73*		*Mean: 0.09*		*Mean: 0.15*		*Mean: 0.58*	
Millions of USD*Three decades post	-0.004	0.003	-0.001	-0.002	0.0068***	-0.001	0.004	0.008
	(0.004)	(0.005)	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.007)
	[0.004]***	[0.004]***	[0.112]	[0.483]	[0]***	[0]***	[0.248]	[0.196]
Millions of USD*Two decades post	-0.0086***	-0.005	0.001	0.000	0.0085***	0.0042***	-0.006	-0.004
	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.004)	(0.005)
	[0.004]***	[0.004]***	[0.982]	[0.802]	[0]***	[0.004]***	[0.004]***	[0.004]***
Millions of USD*One decade post	-0.0063***	-0.0037**	0.000	0.000	0.0037**	0.000	-0.0077***	-0.0060**
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)
	[0.024]**	[0.208]	[0.587]	[0.188]	[0.263]	[0.846]	[0.004]***	[0.028]**
N	96	96	96	96	96	96	96	96

Standard errors clustered at district level. Robust standard errors are in parentheses. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample *t* -distribution. p values from the wild cluster bootstrap procedure in square brackets]. Migrant capital is the total deferred pay returning to each district by 1975, in millions of USD. Data are from Census 1977, 1987 (one decade post), 1998 (two decades post) and 2008 (three decades post). Unit of observation is the district-gender cell. Total districts=24. Total observations in each regression is 96. All regressions include district and year fixed effects and interactions of a linear trend term with baseline variables (adult literacy in 1945, population density in 1945, a malaria dummy, share of men and women married in 1966, share of men and women not earning any cash income in 1966, two region dummies). Industrial concentration is a Herfindahl index measuring how concentrated work is in any one sector.

Robustness Appendix Table 3: Long run impacts of migrant capital inflows on share of workers in different sectors
Without district fixed effects and baseline controls interacted with decade dummies

	Share in Agriculture						Share in Manufacturing				Share in Services				
Panel A: Women			*Mean: 0.88*					*Mean: 0.02*					*Mean: 0.08*		
Millions of USD*Three decades post	-0.0238***	-0.0126***	-0.0157***	-0.0118***	-0.00851***	0.0014**	-0.0004	0.00151**	-0.0007	0.00153*	0.0224***	0.0139***	0.0168***	0.0146***	0.00874***
	(0.004)	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.005)	(0.003)	(0.003)	(0.004)	(0.002)
Millions of USD*Two decades post	-0.0211***	-0.0108***	-0.0126***	-0.0109***	-0.00874***	0.0013***	-0.0004	0.0007	-0.0007*	0.0008	0.0150***	0.0072***	0.00922***	0.0074***	0.00366**
	(0.005)	(0.002)	(0.002)	(0.003)	(0.002)	0.000	(0.000)	(0.001)	(0.000)	(0.001)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)
Millions of USD*One decade post	-0.0137***	-0.003	-0.00359*	-0.0021**	-0.0011	0.0020***	0.0002	0.0006	0.0002	0.000908**	0.0098***	0.002	0.0027	0.0010	-0.0008
	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	0.000	(0.000)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
P value for Joint F on Migrant capital	0.000	0.000	0.00	0.00	0.00	0.000	0.333	0.05	0.00	0.04	0.00	0.00	0.00	0.00	0.00
P value for Joint F on Number of migrants				0.01	0.00				0.00	0.56				0.02	0.00
Panel B: Men			*Mean: 0.73*					*Mean: 0.09*					*Mean: 0.15*		
Millions of USD*Three decades post	-0.0252***	0.001	-0.00590**	0.0057***	-0.00055	0.0056***	-0.0045**	0.0000	-0.0059***	-0.0002	0.0201***	0.0051**	0.00784***	0.0026**	0.0015
	(0.003)	(0.005)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Millions of USD*Two decades post	-0.0335***	-0.0072*	-0.0116***	-0.0034***	-0.00745***	0.0093***	-0.00100	0.0019	-0.0027***	0.0011	0.0235***	0.0083***	0.01000***	0.0065***	0.00575***
	(0.004)	(0.004)	(0.003)	(0.001)	(0.003)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)
Millions of USD*One decade post	-0.0306***	-0.005	-0.00665***	-0.0025**	-0.00446***	0.0091***	-0.00100	0.0004	-0.0015	0.00035	0.0180***	0.0030	0.00380**	0.0015**	0.0010
	(0.005)	(0.004)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
P value for Joint F on Migrant capital	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.45	0.00	0.00	0.00	0.00	0.00
P value for Joint F on Number of migrants				0.00	0.04				0.00	0.56				0.00	0.00
Controls for number of migrants	N	N	N	Y	Y	N	N	N	Y	Y	N	N	N	Y	Y
District FE	N	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y
Other controls	N	N	Y	N	Y	N	N	Y	N	Y	N	N	Y	N	Y

Standard errors clustered at district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample *t* -distribution. Migrant capital is the total deferred pay returning to each district by 1975, in millions of USD. Data are from Census 1977, 1987 (one decade post), 1998 (two decades post) and 2008 (three decades post). Unit of observation is the district-gender cell. Total districts=24. Total observations in each regression is 96. Other controls include a linear trend interacted with all baseline district variables (adult literacy in 1945, population density in 1945, a malaria dummy, share of men and women married in 1966, share of men and women not earning any cash income in 1966, two region dummies). Industrial concentration is a Herfindahl index measuring how concentrated work is in any one sector. Regressions are population weighted. The final column for each outcome presents the same results as appear in Table 5.

Robustness Appendix Table 4: Long run impacts of migrant capital inflows on share of workers in different sectors

Excluding Lilongwe

	Share in Agriculture	Share in Manufacturing	Share in Services	Industrial concentration
Panel A: Women	*Mean: 0.88*	*Mean: 0.02*	*Mean: 0.07*	*Mean: 0.8*
Millions of USD*Three decades post	-0.0093**	0.0033**	0.0084**	0.0009
	(0.004)	(0.002)	(0.004)	(0.004)
Millions of USD*Two decades post	-0.0107***	0.0023**	0.0041	-0.0137***
	(0.003)	(0.001)	(0.003)	(0.003)
Millions of USD*One decade post	-0.0016	0.0016**	-0.0010	-0.0050**
	(0.002)	(0.001)	(0.002)	(0.002)
R2	0.99	0.92	0.98	0.99
P value for Joint F on Migrant capital	0.00	0.14	0.00	0.00
P value for Joint F on Number of migrants	0.01	0.08	0.15	0.00
Panel B: Men	*Mean: 0.73*	*Mean: 0.09*	*Mean: 0.15*	*Mean: 0.58*
Millions of USD*Three decades post	0.0048	-0.0026	0.0000	0.0073
	(0.004)	(0.003)	(0.002)	(0.006)
Millions of USD*Two decades post	-0.0061**	0.0006	0.0060***	-0.0078*
	(0.003)	(0.002)	(0.002)	(0.004)
Millions of USD*One decade post	-0.0032**	-0.0003	0.0009	-0.0065***
	(0.001)	(0.001)	(0.001)	(0.002)
	(0.003)	(0.002)	(0.001)	(0.004)
R2	0.99	0.95	0.99	0.98
P value for Joint F on Migrant capital	0.00	0.01	0.00	0.00
P value for Joint F on Number of migrants	0.00	0.09	0.00	0.02
N	92	92	92	92

Standard errors clustered at district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample *t*-distribution. Migrant capital is the total deferred pay returning to each district by 1975, in millions of USD. Data are from Census 1977, 1987 (one decade post), 1998 (two decades post) and 2008 (three decades post). Unit of observation is the district-gender cell. Total districts=24. Total observations in each regression is 92; Lilongwe is omitted. All regressions include district and year fixed effects and interactions of a linear trend term with baseline variables (adult literacy in 1945, population density in 1945, a malaria dummy, share of men and women married in 1966, share of men and women not earning any cash income in 1966, two region dummies). Industrial concentration is a Herfindahl index measuring how concentrated work is in any one sector. Regressions are population weighted.

Appendix Robustness Table 5: Long run impacts of migrant capital on share of workers in different sectors
Nonlinear controls for migrants (migrants, migrants squared)

	Share in Agriculture	Share in Manufacturing	Share in Services	Industrial concentration
Panel A: Women	*Mean: 0.88*	*Mean: 0.02*	*Mean: 0.08*	*Mean: 0.8*
Millions of USD*Three decades post	-0.0066**	0.002	0.0066**	0.004
	(0.003)	(0.002)	(0.002)	(0.004)
Millions of USD*Two decades post	-0.0091***	0.002	0.003	-0.0121***
	(0.003)	(0.001)	(0.003)	(0.003)
Millions of USD*One decade post	-0.001	0.0015*	-0.002	-0.0041*
	(0.002)	(0.001)	(0.002)	(0.002)
R2	0.99	0.93	0.99	0.99
P value for Joint F on Migrant capital	0.00	0.07	0.00	0.00
P value for Joint F on Number of migrants	0.00	0.01	0.00	0.00
Panel B: Men	*Mean: 0.73*	*Mean: 0.09*	*Mean: 0.15*	*Mean: 0.58*
Millions of USD*Three decades post	0.004	-0.003	0.001	0.005
	(0.004)	(0.003)	(0.001)	(0.007)
Millions of USD*Two decades post	-0.0069**	0.001	0.0064***	-0.0094**
	(0.003)	(0.002)	(0.001)	(0.004)
Millions of USD*One decade post	-0.0037**	0.000	0.001	-0.0074***
	(0.002)	(0.001)	(0.001)	(0.003)
R2	0.99	0.95	0.99	0.98
P value for Joint F on Migrant capital	0.00	0.16	0.00	0.00
P value for Joint F on Number of migrants	0.00	0.00	0.00	0.00
N	96	96	96	96

Standard errors clustered at district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample *t* -distribution. Migrant capital is the total deferred pay returning to each district by 1975, in millions of USD. Data are from Census 1977, 1987 (one decade post), 1998 (two decades post) and 2008 (three decades post). Unit of observation is the district-gender cell. Total districts=24. Total observations in each regression is 96. All regressions include district and year fixed effects and interactions of a linear trend term with baseline variables (adult literacy in 1945, population density in 1945, a malaria dummy, share of men and women married in 1966, share of men and women not earning any cash income in 1966, two region dummies). Industrial concentration is a Herfindahl index measuring how concentrated work is in any one sector. Regressions are population weighted.

Appendix Robustness Table 6: Long run impacts of migrant capital on share of workers in different sectors
Nonlinear controls for migrants (Ln migrants)

	Share in Agriculture	Share in Manufacturing	Share in Services	Industrial concentration
Panel A: Women	*Mean: 0.88*	*Mean: 0.02*	*Mean: 0.08*	*Mean: 0.8*
Millions of USD*Three decades post	-0.0060**	0.002	0.0060***	0.005
	(0.003)	(0.002)	(0.002)	(0.004)
Millions of USD*Two decades post	-0.0079***	0.001	0.002	-0.0100***
	(0.003)	(0.001)	(0.003)	(0.004)
Millions of USD*One decade post	0.000	0.001	-0.002	-0.003
	(0.002)	(0.001)	(0.002)	(0.002)
R2	0.99	0.92	0.98	0.99
P value for Joint F on Migrant capital	0.00	0.02	0.00	0.00
P value for Joint F on Number of migrants	0.00	0.37	0.00	0.00
Panel B: Men	*Mean: 0.73*	*Mean: 0.09*	*Mean: 0.15*	*Mean: 0.58*
Millions of USD*Three decades post	0.002	-0.002	0.001	0.002
	(0.004)	(0.002)	(0.001)	(0.005)
Millions of USD*Two decades post	-0.0067**	0.001	0.0056***	-0.0094***
	(0.003)	(0.002)	(0.001)	(0.003)
Millions of USD*One decade post	-0.0039**	0.000	0.001	-0.0078***
	(0.002)	(0.001)	(0.001)	(0.002)
R2	0.98	0.94	0.99	0.97
P value for Joint F on Migrant capital	0.00	0.50	0.00	0.00
P value for Joint F on Number of migrants	0.02	0.60	0.00	0.95
N	96	96	96	96

Standard errors clustered at district level. Significance levels ***p<0.01, **p<0.05, *p<0.1 where critical values are taken from the small sample *t*-distribution. Migrant capital is the total deferred pay returning to each district by 1975, in millions of USD. Data are from Census 1977, 1987 (one decade post), 1998 (two decades post) and 2008 (three decades post). Unit of observation is the district-gender cell. Total districts=24. Total observations in each regression is 96. All regressions include district and year fixed effects and interactions of a linear trend term with baseline variables (adult literacy in 1945, population density in 1945, a malaria dummy, share of men and women married in 1966, share of men and women not earning any cash income in 1966, two region dummies). Industrial concentration is a Herfindahl index measuring how concentrated work is in any one sector. Regressions are population weighted.

Robustness Appendix Table 7: Are districts that received more migrant money wealthier 15 years later? Evidence from Malawi's 1992 Demograhic Health Survey - District-level regressions

	Additional controls [N=24 in all regressions]			
Outcome	None	+Migrants	+Region FE	+Baseline district controls
DHS Wealth index	0.0479***	0.0580***	0.0595***	0.0492***
	(0.013)	(0.009)	(0.008)	(0.013)
Count of assets	0.0637***	0.0697***	0.0763***	0.0904**
	(0.018)	(0.016)	(0.018)	(0.041)
Durable roof	0.0223***	0.0259***	0.0252***	0.0225***
	(0.006)	(0.004)	(0.003)	(0.005)
Durable floor	0.0169***	0.0212***	0.0216***	0.0210***
	(0.005)	(0.003)	(0.003)	(0.005)
Improved toilet	0.0131**	0.0193***	0.0218***	0.010
	(0.006)	(0.003)	(0.005)	(0.010)
Improved drinking water source	0.001	-0.00433*	-0.004	0.006
	(0.005)	(0.002)	(0.004)	(0.013)
Improved other water source	0.002	-0.003	-0.003	0.012
	(0.006)	(0.003)	(0.005)	(0.012)
Electricity	0.00589***	0.00678***	0.00675***	0.00389***
	(0.001)	(0.001)	(0.001)	(0.001)
Radio	0.007	0.0111**	0.0136**	0.0143*
	(0.006)	(0.005)	(0.005)	(0.007)
Car	0.00244***	0.00228***	0.00220***	0.00272***
	(0.000)	(0.000)	(0.000)	(0.001)
Bicycle	-0.00637**	-0.00952***	-0.00867***	-0.005
	(0.003)	(0.002)	(0.003)	(0.007)

Robust standard errors clustered at the district level. Each block of coefficients is estimated in a separate regression of the outcome variable (first column) on the amount of migrant capital returning to the district by 1975, and a series of controls variables: number of migrants 1966-1975, region fixed effects, baseline district level controls including population density in 1945, literacy rates, an indicator for estates in the district, the share of men and women married in 1966 and the share of men and women working for no cash wage in 1966. All outcomes are indicators except for number of assets (the count of asset measures per household) and the DHS wealth index, which is a composite index of household assets constructed using principal components analysis.