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FDI and inequality in Vietnam: An approach with census data☆

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ABSTRACT

We investigate the effects of inward FDI on income distribution and absolute living standards in Vietnam using census data from 1989 to 2009. We compute the number of employees of foreign establishments in each of Vietnam's provinces for each year, and use that as a measure of local FDI. We estimate the effects of FDI on local households' living standards as reported in the data, broken down by educational background to allow us to analyze effects on inequality. Estimates based on the repeated cross section indicate that rising FDI in a province is associated with a slight decline in living standards for households there if they do not have a member employed by the foreign enterprises, with only modest gains for households who do have a member employed by the foreign enterprises. These estimates may reflect composition effects, however, since we find large movements of people toward the provinces receiving the FDI. The findings show that measuring the effect of FDI on household welfare is more difficult than measuring the effect of trade policy, and may pose a difficulty for the view of FDI as a general anti-poverty strategy.

1. Introduction

OECD countries, and not least both the US and Japan, have embraced FDI as a primary tool of economic development in low-wage economies, and even perhaps as a more important tool than Official Development Aid. However, there has been much debate over the effects of FDI on the host economies, and particularly its effects on income inequality. Perhaps the most important channel by which FDI can affect income inequality is by shifting the demand for labor. In principle, FDI could either raise or lower income inequality in this way.

This paper attempts to measure this effect in the case of Vietnam. Vietnam is an extremely interesting one for measuring the effects of trade and foreign investment because of its rapid transition from a relatively closed centrally-planned economy to a very open market-based economy. McCaig and Pavcnik (2013) document the dramatic restructuring of the economy from the late 1980s to 2008 following the Doi Moi market reforms of 1986, with a large drop in the share of agriculture in employment and GDP and increases in the share of manufacturing and especially services. The share of State-Owned Enterprises (SOE's) has fallen as SOE's have lost subsidies and failing SOE's have been allowed to exit, and the role of foreign enterprises has increased rapidly as restrictions on foreign ownership have been relaxed. At the same time, increases in labor

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productivity in each sector combined with movements away from the lowest-productivity sector (agriculture) have resulted in a doubling of income per capita. The Vietnamese economy has been the recipient of a large volume of Japanese FDI, with smaller flows from the US to date, but that is likely to change given the close trade ties between the US and Vietnam, and particularly if the Trans-Pacific Partnership is ratified, which would provide for free trade between Vietnam and several other top trade partners including the United States.

To address the effect of FDI on income inequality in Vietnam, we use data from the 1989 to 2009 Population and Housing Census (hereafter, the 'Census'), each of which records the industry and province of employment for each worker, as well as an unusual piece of information that is crucial for the question at hand: whether the worker is employed in a private entity, state enterprise, or foreign-owned enterprise. The amount of FDI into each industry and province can be computed by adding up the number of workers in foreign-owned entities. This is available for 1999 and 2009, so our regressions focus on those years (using some information from 1989 for initial conditions).

If the Census also provided wage data, a Mincer wage regression could then be used to establish whether or not the skilled wage premium has moved systematically together with FDI inflows either by industry or by province, and in what direction. Specifically, controlling for all available personal characteristics, a measure of the worker's skill level could be interacted with the number of foreign-owned enterprise jobs in the province. This would allow us to test for the possibility that a hiring surge by multinationals in a particular location has an effect on skill premia, and we could estimate it both for those actually employed in the foreign sector and for those outside of it.

Unfortunately, wage data were not collected by the Census, so indirect methods are required. The Census does ask a wide variety of questions that can be used to gauge a household's standard of living. Does the household have access to piped water? Is it piped into the household's dwelling? Does the household have access to electricity? Does it own a radio? A television? What is the rate of child mortality? These can be observed over time to see if people living in a province that saw a greater FDI inflow also were more likely to see a measurable improvement in living standards as measured in these basic amenities. In addition, we can look for a differential effect by education: Were households with more high-school-educated adults, for example, more likely to see an improvement in their living conditions, in provinces with a large FDI inflow, compared to those with less education? Is there any educational class that saw a *worsening* in living conditions, or a slower improvement relative to other groups, when more FDI is present?

This allows us to measure the pure general-equilibrium effect of FDI on local income inequality operating through its effect on labor demand. This approach can also be used to examine the effect of FDI on the absolute level of local real income, assuming that all of the amenities in question are normal goods.

Before turning to our approach in detail, we will review some of the main theoretical ideas and existing literature.

1.1. Theoretical ideas

There are many reasons inward FDI could increase income inequality and many reasons it could have the opposite effect. Here we mention three different mechanisms as examples.

(i) *Inward FDI could compete with domestic capital for domestic workers, pushing down the income of domestic capitalists and raising the incomes of domestic workers.* This is the idea behind the political argument of Pandya (2014) that the median voter should typically be in favor of policies to welcome FDI. One simple model in which this outcome emerges is as follows. Home is a small open economy with multiple industries, each producing some tradable output by combining labor and capital with constant returns to scale. The capital for each industry is sector-specific, meaning that it can be used only for that industry, and it is available in a fixed amount. There is an exogenous supply of homogeneous workers, who can switch from one industry to another costlessly. Each citizen has one unit of labor, but some in addition own some capital, creating income inequality. An increase in inward FDI to any of the industries raises the marginal product of labor in that industry, raising aggregate labor demand and the equilibrium wage. This decreases income per unit of capital in each industry (since output prices are determined on world markets and remain unchanged). As a result, incomes of low-income citizens (who have only labor income) rise proportionally more than the incomes of higher-income citizens (who receive income gains on their labor but income reductions on their capital). In this model, inward FDI unambiguously reduces income inequality.

(ii) *Inward FDI could shift the mix of tasks performed in the economy in the direction of increased skill intensity.* This mechanism is developed in detail in Feenstra and Hanson (1996) (a similar story with a slightly different mechanism emerges in Zhu and Trefler (2005) and Raveh and Reshef (2016)). In that model, there is one manufactured good that requires a continuum of inputs to produce. Each input requires high-skilled labor, low-skilled labor and capital to produce, and can be produced either in North or in South. Each country has an exogenous endowment of all three factors, and the ratio of high-skilled to low-skilled labor is higher in North. The inputs differ in the ratio of high-skilled and low-skilled labor required to produce them.

In equilibrium, the ratio of high-skilled to low-skilled wages is higher in South, so it is more expensive to produce very skilled-labor intensive inputs in the South than in the North, and *vice versa* for very low-skilled-labor intensive inputs. Therefore, there is a cutoff input such that inputs that are more skilled-labor-intensive than the cutoff are produced in North and less skilled-labor-intensive inputs are produced in South. Now, if FDI transfers some capital from North to South, the cutoff input changes: The increased productivity of Southern labor expands the range of inputs produced in the South, so that the new cutoff is more skill-labor intensive than the old one. Consequently, the least skilled-labor intensive inputs that had previously been produced in North are now produced in South, where they become the most skilled-labor

intensive inputs produced in South. As a result, the relative demand for skilled labor goes up in both countries, increasing wage inequality.

The result is that in this model, inward FDI reduces the income of South's capitalists, which in and of itself lowers inequality; but it increases wage inequality, which pushes in the other direction.

(iii) *Inward FDI could be more or less skill intensive than domestic businesses in its own demand for labor.* Consider the following illustrative model. Home is a small open economy, with a range of industries, each producing a traded good combining skilled and unskilled labor with constant returns to scale. To keep the argument as simple as possible, suppose that all of these industries have the same production function.[1] In addition, there is a sector that requires foreign capital to produce, in combination with both kinds of labor. Think, for example, of an oil field that requires foreign technology to exploit, or an assembly operation that will use foreign machines plus local labor to produce products for export. For simplicity, suppose that the foreign-capital-using sector uses skilled workers in a fixed ratio, S^F, to unskilled, and that all capital is foreign-owned.

Suppose that initially there is no foreign capital at all, and the economy's exogenous ratio of skilled to unskilled labor is $\overline{S}$. Now, allow a small amount of inward FDI, so that the foreign-capital-using sector begins hiring local workers, S^F skilled workers for each unskilled worker. If $S^F > \overline{S}$, the labor left over for the domestic industries has a lower ratio of skilled to unskilled workers than $\overline{S}$, and so the skilled-to-unskilled wage ratio must rise to induce domestic employers to substitute toward unskilled workers and restore labor-market clearing. The result is a rise in wage inequality (which in this illustrative model is also a rise in overall inequality). In this case, FDI reduces the absolute wages of the unskilled workers as well, since in each domestic firm the ratio of skilled to unskilled workers, and hence the marginal product of unskilled labor, will fall. If $S^F < \overline{S}$, inequality is reduced, and real incomes of unskilled workers are increased, due to FDI, following the same logic.

The former case could be quite plausible in the case of extractive industries; perhaps a new oil well will require 1 engineer, 1 supervisor, and 20 manual workers; but if the typical domestic employer has 1 supervisor for 100 manual workers, the oil well removes from the domestic economy skilled workers who would normally employ 200 manual workers, while providing new jobs in the foreign-capital-using sector for only 20 of them. The resulting net decrease in unskilled labor demand requires a drop in unskilled wages to restore equilibrium. The opposite outcome is more likely for an assembly operation, where the skilled-unskilled ratio might be comparable to or even below the domestic-sector average.

These three examples are by no means exhaustive. Indeed, there is now a rich theoretical literature on the relationship between trade and inequality (Harrison, McLaren, & McMillan, 2011), and any one of those models would have its own implications for the effect of FDI on inequality. These examples merely illustrate the point that there can be no theoretical presumption regarding whether inward FDI will raise or lower income inequality, whether it will raise or lower the real incomes of low-skilled workers, or whether it will raise or lower poverty rates. Only empirical enquiry can answer these questions.

1.2. Literature review

A broad literature investigates the relationship between FDI and income inequality. Macro approaches are exemplified by Jaumotte, Lall, and Papageorgiou (2008), who use panel data for 51 countries over 1981–2003 and find a positive effect of FDI on income inequality but a negative effect of trade. Im and McLaren (2015) suggest that such findings may be due to the endogeneity of FDI, and find a negative effect on inequality, once FDI inflows are instrumented by a range of variables. Raveh and Reshef (2016) examine the effects of capital imports on the skill premium in wage data for a wide panel of countries, using changes in unit prices of different types of capital as instruments. They find that the *composition* of capital imports is more important than the *quantity* of capital imports, with more R&D intensive capital imports promoting increased skilled-wage premia.

Micro studies tend to examine the effect of FDI on wages in the host country. Lipsey (2004) surveys a wide range of studies, finding robust evidence that multinationals raise incomes for the workers whom they hire, but little evidence either way on the effects of multinationals on the income of other workers in the same labor market. We provide some evidence on that question.

A small number of studies based on micro data investigate the effects of FDI on outcomes of living standards in a manner somewhat analogous to what we are attempting here. Atkin (2009) uses the height of a worker's children as a measure of economic outcomes in response to local hiring by multinationals in Mexico. Apart from FDI, (Young, 2012) uses a range of tangible variables quite similar to what we use here (ownership of a television, access to electricity, various health measures) from the Demographic and Health Surveys of USAID to assess economic growth trends in Africa.

This study is also related to the literature that assesses the effects of globalization by exploiting intra-national geographic variation in its effects. Edmonds and Pavcnik (2005) studied the effect of the mid-1990s liberalization of rice exports in Vietnam on child labor, by using variation in the effect on rice prices across different locations within the country. Topalova (2007) studied the poverty effects of the Indian trade liberalization of the early 1990s by using differences in the intensity of

[1] This is not essential to make the point. If different industries differ in their skilled-labor intensities, then analyzing labor demand is complicated by the fact that the mix of products produced will be endogenous, as varying the skilled-wage-to-unskilled-wage ratio will move the economy from one cone of specialization to another. But this is only a complication and does not affect the main point under discussion.

the shock across districts. Many studies have followed in this vein. Particularly relevant for our present purposes is Hanson (2007), who used geographic variation in FDI in Mexico to investigate the effect on income inequality there, finding modest evidence in Census data that FDI (and trade) raise inequality.

The rapid changes in Vietnam have provided the setting for a number of studies focused on income effects of globalization in that country in particular. Aside from Edmonds and Pavcnik (2005) mentioned above McCaig (2011) finds that the reduction of US tariffs on Vietnamese goods following the 2000 bilateral agreement significantly reduced poverty, with the most-affected provinces showing the largest reductions in poverty. McCaig and Pavcnik (2014) show that the same tariff reductions led to a large reallocation within affected industries from informal production to the formal enterprise sector. Brambilla, Porto and Tarozzi (2012) show that US protectionist actions limiting exports of Vietnamese catfish lowered incomes of affected households. Although in this study we use variation in international shocks at the level of the province analogously to McCaig (2011), this appears to be the first study to look at the effects of FDI on welfare of Vietnamese households in a similar way.

2. Empirical approach

Our outcome variables are observed at the household level, so all of our individual-level data needs to be aggregated to the household level. Given a household h living in province i in year t, consider an outcome variable y_h. This could be a dummy variable for the presence of a television in the household, for example. Once we condition on h, we do not need to condition on i or t, because each household in the sample is observed in only one year of the data, and of course lives in only one province. It will be useful to write $i(h)$ and $t(h)$ for the location and year of observation, respectively, of household h.

Given that we have no income variables, the simplest way to measure the effect of FDI in the local labor market would be through a regression of the following sort:

$$y_h = \beta_0 + \beta_1 n_h + \sum_j \beta_2^j n_h^j + \beta_3 n_h^{FOR} + \beta_4 FOR_{i(h),t(h)} + \beta_5^{i(h)} + \beta_6^{t(h)} + \epsilon_h. \quad (1)$$

Here, n_h is the number of members in the household; n_h^j is the number of adult members of educational class j, where j takes one of four values, indicating that the highest level of education achieved is either 'less than primary,' 'primary,' 'secondary,' or 'university;' n_h^{FOR} is the number of adult household members employed by a foreign employer; $FOR_{i,t}$ is the number of workers employed by foreign employers in province i in year t, normalized by the initial population of province i;[2] and β_5^i and β_6^t are province and year fixed effects respectively. The n_h^j are controls for the human capital endowment of the household. This last variable, $FOR_{i,t}$, is the main variable of interest. If its coefficient β_4 is positive, then that implies that households living in provinces with a greater increase in FDI during the period under study saw a greater increase in the probability of owning a television, or whatever the particular outcome variable is. Note that we are controlling for whether or not the household has members who are themselves employed by foreign enterprises through n_h^{FOR}, so this would demonstrate that even those who are not themselves hired by foreign firms nonetheless benefit from the increased local demand for labor that the foreign firms create.

A comment on how to interpret the demographic coefficients may be in order. Increasing n_h^j, holding n_h constant, implies exchanging one working-age adult with education j for one child or senior citizen. Therefore, each of the β_2^j coefficients measures the effect of a reduction in the household's dependency ratio, with higher values of j implying higher levels of education for the working-age member in question. On the other hand, an increase in n_h, holding the n_h^j variables constant, implies addition of one non-working-age dependent to the household, whose effect is measured by β_1.

Now, Eq. (1) is framed as if an increase in FDI will have the same effect for all households in the same province, but of course that may not be the case, and indeed the discussion above indicates that there are many reasons FDI might affect the real incomes of households with different human capital to different degrees, or even in different directions. We can investigate such differences with the modified equation as follows:

$$y_h = \beta_0 + \beta_1 n_h + \sum_j \beta_2^j n_h^j + \beta_3 n_h^{FOR} + \sum_j \beta_4^j n_h^j FOR_{i(h),t(h)} + \beta_5^{i(h)} + \beta_6^{t(h)} + \epsilon_h. \quad (2)$$

The difference from (1) is in the fourth term, which interacts the household human-capital variables with the provincial foreign-hiring variable. If $\beta_4^j > 0$ for all j, then a rise in local foreign hiring improves living conditions for households of all human capital levels. However if, for example, $\beta_4^1 < 0$ while $\beta_4^4 > 0$, then local foreign investment improves living standards for highly-educated households, while worsening things for lower-education households.

An obvious problem with this approach is the possible endogeneity of foreign hiring. This could arise for many reasons. For example, if a province receives a new highway or an improved electrical grid, that could increase incomes and living

[2] More precisely, this is the number of foreign-employed workers in province i at date t, divided by the population of province i in 1989, unless that population figure is not available, in which case we use the population in 1999.

standards throughout the province, and at the same time make the province more attractive for foreign investment. If there are enough shocks of that sort, a spurious positive correlation between foreign hiring and living standards will be induced, and regressions of the sort we are using will overstate any benefit from the foreign hiring. On the other hand, during this period the State-Owned Enterprise (SOE) sector contracted very rapidly as market reforms proceeded (McCaig & Pavcnik, 2013, pp. 13–14). In a province with a heavy concentration of SOE's, the reduction in labor demand from that sector could in and of itself reduce wages and living standards, but that same reduction in wages would also make the province more attractive to foreign enterprises. If there are enough shocks of that sort, a spurious *negative* correlation between foreign hiring and living standards will be induced, and regressions of the sort we are using will *understate* any benefit from the foreign hiring. Many such possible correlations between foreign hiring and omitted variables can be contemplated.

To deal with this issue, we have explore two different instrumental variable strategies as follows.

(i) A shift-share approach. We can construct a simple instrumental variable as follows. For each industry k, we construct from the Census data the share θ_i^k of that industry's total jobs nationwide that are located in province i as of 1989.[3] Then, for year $t = \{1999, 2009\}$, we sum up the total foreign employment nationwide in industry k for year t, $foreign\_empl_t^k$. Our instrument for $FOR_{i,t}$ is then $IV_{i,t}^{SS} \equiv \sum_k \theta_i^k foreign\_empl_t^k$. This is analogous to a standard instrument, variously called a 'shift-share' or 'supply-push' instrument, used in the immigration literature to deal with the endogeneity of immigrant inflows as popularized by Card (2001). It should be uncorrelated with local productivity and labor-demand shocks subsequent to 1989, but correlated with local foreign hiring to the extent that a multinational enterprise will prefer to hire, other things equal, in locations where that firm's industry has already established itself.

(ii) An approach based on foreign supply of FDI. An alternative approach is based on data from foreign FDI outflows. For countries that are major suppliers of FDI, we can define $outflow_t^k$ as the outflow of FDI worldwide in industry k and year t. We can then define $IV_{i,t}^{FS} \equiv \sum_k \theta_i^k outflow_t^k$. This can be called a 'foreign supply' instrument, and is analogous to the instrument used by Hummels, Jørgensen, Munch, and Xiang (2014) for offshoring by Danish firms.

A difficulty that has plagued both approaches is that for most specifications the IV's produced tend to be weak, with first-stage F-statistics well below 10. Trial and error has led us to use the 'foreign-supply' specification constructed from outward FDI from Japan, lagged 2 years. It is not surprising that this is the strongest instrument, since Japan has been by far the largest source of FDI to Vietnam (although Vietnam makes up a small share of Japan's FDI). Our only criterion has been to find the IV method that produces the strongest first stage, as measured by the first-stage F-statistic. As reported at the bottom of our results tables, the F-statistic tends to range from just over 3 to 7 with this approach.

2.1. Data

We use the 1989, 1999 and 2009 Vietnam Population and Housing Census, from which we have an anonymized 5%, 3% and 15% sample respectively, taken from the Integrated Public Use Micro Samples system (IPUMS) (Ruggles et al., 2010).[4] As Table 1 presents, we have 19,172,742 individuals in our sample, divided into 4,226,009 households, with an average of 3.914 members per household. The data are divided into 43 provinces.[5] A fraction 60.19% of the individuals are adults, defined as the ages between 18 and 65. On average, there are 0.038 adult workers per household who are employed by the foreign firms – about one foreign-employed worker for every 26 households. The average household has 0.703 adults with less than primary education and 1.19 adults with only primary education completed. About one in three households has a high-school graduate, and about one in eight a college graduate. The number of Adult FDI workers in each province in each year is scaled by the person weights so that we have correct representation from each sample.[6] On average, there are 3088 adult workers employed in the foreign sector in a given province in year 1999 and 38,433 workers in year 2009, which, as shown in Table 1, amounts to about half a percent and 4.8% of the initial provincial population respectively.

The census records the 'foreign enterprise' indicator, which is our means of keeping track of trends in FDI employment, for all three years. However, in 1989, no worker is recorded as employed by a foreign entity (to be precise, not a single worker in the entire economy). This is clearly an error. For example, the Foreign Investment Law of 1987 opened up almost the entire economy to foreign firms, allowing for 100% foreign ownership in most cases, and provided generous tax incentives. In 1990, FDI was 2.8% of GDP (McCaig and Pavcnik, 2013, pp. 12–13). Consequently, we take the zeros for 1989 as a coding error, and use only the foreign-employment data from 1999 and 2009.

Our data include a wide range of standard-of-living variables at the household level, which we will use as the outcome variables in question. The summary statistics are provided in Table 2. Most of these are dummy variables, i.e., whether the household has an access to electricity, etc. However, 'Living area in square meters' and 'Child deaths' are integers. We define these briefly: *(i) Electricity.* Indicates whether or not the household has access to electricity. *(ii) Water supply.* Indicates

[3] As in footnote 2, for provinces in which the 1989 value is not available we substitute the 1999 value.

[4] The data are available through IPUMS – International: https://international.ipums.org/international/.

[5] In the Census raw data, there were originally 79 distinctive provinces in terms of their names. Brian McCaig pointed out that there was a provincial boundary reform between 1989 and 1999. We are very grateful that McCaig shared his code for constructing time-consistent provinces for our sample periods from 1989 to 2009.

[6] This is a correction required when working with IPUMS samples, as the samples intentionally oversample some demographic groups.

Table 1
Summary statistics of households and province.

	Mean	Std. Dev.	Min	Max	Obs.
Household level					
Number of people	3.914	1.734	1	20	4,226,009
Number of adult	2.356	1.221	0	20	4,226,009
Adult FDI workers	0.038	0.252	0	19	4,226,009
Less than primary education	0.703	1.021	0	16	4,226,009
Primary education	1.190	1.083	0	17	4,226,009
Secondary education	0.332	0.659	0	16	4,226,009
University education	0.130	0.454	0	15	4,226,009
Province level					
Normalized FDI workers in 1999	0.006	0.018	0	0.107	43
Normalized FDI workers in 2009	0.063	0.150	0.0003	0.875	43
Employment in initial year	579,178	408,505	50,153	2,024,101	43
Employment in 1999	4,330	14,717	0	80,554.98	43
Employment in 2009	37,104	86,117	41.65	399,008	43

Table 2
Summary statistics of households' living standards.

Living standards	Mean	Std. Dev.	Min	Max	Obs
Electricity	0.9401	0.2371	0	1	4,222,136
Water supply	0.2126	0.4091	0	1	4,222,627
Private water supply	0.2063	0.4047	0	1	4,222,627
Television set	0.8162	0.3873	0	1	4,223,687
Radio	0.2356	0.4244	0	1	4,212,082
Toilet	0.8872	0.3163	0	1	4,205,940
Flush toilet	0.4404	0.4964	0	1	4,205,940
Living area in square meters	66.797	44.995	3	998	4,105,128
Number of children dead	0.0525	0.2924	0	9	451,861

whether or not the household has access to piped water. *(iii) Private water supply.* Indicates whether or not the household has access to water that is piped right into the household's dwelling. *(iv) Television set.* Indicates ownership of at least one television, either color or black and white. *(v) Radio in household.* Indicates ownership of a radio. *(vi) Toilet.* Indicates that the household has a toilet of any kind, including flush toilets and latrine-type toilets. *(vii) Flush toilet.* Indicates the flushable subset of the previous indicator. *(viii) Living area in square meters.* Indicates total area of the household's dwelling. *(ix) Child deaths.* Indicates the number of children ever born alive to a woman in the household who are no longer living (including from fathers not in the household but excluding still births).

We have had to omit data on a number of other interesting living-standard variables because they are not available for both 1999 and 2009. These include: access to a sewage system or septic tank; presence of a telephone within the dwelling; air conditioning; personal computer; clothes-washing machine; refrigerator; number of rooms; and number of bedrooms.

These amenities vary widely in the breadth of their availability. For example, in our data, 94% of households have access to electricity, while 23.6% have a radio. Only 21% have access to piped water, but 81.6% have a television. The average dwelling is 67 square meters (about 710 square feet) in size.

3. Results

The results from Eq. (1) estimated with OLS are shown in Table 3. Each column presents results from a regression with a different dependent variable. Each row lists estimated coefficients from a different regressor, which are in order: *Foreign-employed in province*, the number of adults employed by foreign enterprises in the province and year in which the household is located (*FOR_i(h),t(h)* above); *Size of household*, the number of people of any age in the household (n_h above); *Adults without primary education*, the number of adults with less than primary education (n_h^{LTP} above); *Adults with primary school*, the number of adults with primary education (n_h^{Pri} above); *High-school graduates*, the number of adults with secondary education (n_h^{Sec} above); *College graduates*, the number of adults with university education (n_h^{Univ} above); *Foreign-employed in household*, the number of adults in the household employed by a foreign enterprise (n_h^{FOR} above); and *Urban*, a dummy variable indicating that the household lives in an urban location. Each regression has year and province fixed effects, and all standard errors are clustered at the province level.

Note that in controlling for the regressors in rows 3 through 6, we are controlling for the number of working-age adults in the household, so the second row shows the effect of an increase in the number of non-working age household members,

Table 3
OLS (1): effect of FDI on living standards.

Variables	(1) Elec	(2) Water	(3) Water_priv	(4) TV	(5) Radio	(6) Toilet	(7) Toilet_flush	(8) Livearea	(9) Chdead
Foreign-employed in province	0.0620	0.0374	0.0419	−0.102**	−0.0773***	0.00725	0.369***	−11.03***	−0.0252*
	(0.0851)	(0.0356)	(0.0344)	(0.0449)	(0.0190)	(0.0241)	(0.0437)	(3.223)	(0.0149)
Size of household	−0.00751***	−0.00394***	−0.00322**	0.0241***	0.0105***	−0.0144***	−0.00937***	3.223***	0.00400**
	(0.00218)	(0.00130)	(0.00128)	(0.00356)	(0.00129)	(0.00306)	(0.00134)	(0.283)	(0.00181)
Adults without primary education	−0.0171***	−0.0130***	−0.0136***	−0.0316***	−0.00383*	−0.0310***	−0.0477***	−1.275***	0.0336***
	(0.00276)	(0.00221)	(0.00216)	(0.00492)	(0.00218)	(0.00606)	(0.00330)	(0.394)	(0.00296)
Adults with primary school	0.0249***	−0.000249	−0.000334	0.0533***	0.0170***	0.0395***	0.0233***	2.793***	0.00205
	(0.00390)	(0.00219)	(0.00222)	(0.00581)	(0.00272)	(0.00585)	(0.00485)	(0.427)	(0.00220)
High-school graduates	0.0268***	0.0390***	0.0386***	0.0518***	0.0352***	0.0436***	0.0783***	6.359***	−0.00798***
	(0.00448)	(0.00362)	(0.00365)	(0.00880)	(0.00322)	(0.00631)	(0.00706)	(0.513)	(0.00190)
College graduates	0.0146***	0.0975***	0.0972***	0.0601***	0.0786***	0.0451***	0.145***	15.58***	−0.00954***
	(0.00359)	(0.00606)	(0.00597)	(0.00866)	(0.00456)	(0.00795)	(0.0200)	(0.609)	(0.00249)
Foreign-employed in household	−0.00117	−0.00296	−0.00383	−0.0720***	−0.0270***	−0.00864***	0.0342**	−5.476*	−0.00482**
	(0.00439)	(0.0182)	(0.0183)	(0.0109)	(0.00428)	(0.00312)	(0.0145)	(2.951)	(0.00211)
Urban	0.0660***	0.406***	0.403***	0.0843***	0.0163**	0.0677***	0.328***	8.960***	−0.0221***
	(0.00902)	(0.0247)	(0.0246)	(0.00887)	(0.00792)	(0.0124)	(0.0107)	(0.932)	(0.00295)
Observations	4,222,136	4,222,627	4,222,627	4,223,687	4,212,082	4,205,940	4,205,940	4,105,128	451,861
R-squared	0.141	0.362	0.364	0.155	0.077	0.199	0.338	0.127	0.020
Prov &Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors clustered at the province level in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

holding the number of working-age adults constant. Looking at the results in the second row, we see that an increase in the size of the household is associated with a small increase in living area (about three square meters, perhaps the size of a closet), but otherwise is associated with reduced living standards suggesting that the household budget needs to be stretched further to accommodate the additional dependent. For example, one more non-working-age member is associated with a one-percentage-point reduction in the probability of a toilet in the house. The one exception to this pattern is a small increase in the probability that the household has a radio or TV.

Turning to the human-capital variables, note that the coefficient on n_h^j implies the effect of one more working-age adult of education class j, holding household-size fixed. This effect is in most cases positive for all four educational classes except for the first one, indicating that, holding household size constant, one more working-age adult tends to improve living standards, unless that adult has less than primary education. The coefficients mostly increase as one moves down the column, indicating that having more education has a bigger impact on the living standard. One more uneducated adult is associated with a 1.7 percentage point reduction in the probability that the household has electricity, and a 5 percentage-point reduction in the probability of having a flush toilet. On the other hand, one more university-educated adult is associated with an increased living space of 16 square meters, enough for an extra bedroom, and is associated with a 14.5 percentage-point increase in the probability that the household has a flush toilet. Importantly, adding high-school or college-educated adults to the household reduces child mortality, by approximately 1 percentage point (in other words, one less child death with a probability of 1%).

The *Urban* variable is correlated with improvements in living standards along all fronts. Controlling for all other factors, an urban household is 6.6 percentage points more likely to have electricity, 40 percentage points more likely to have private, piped water, 6.8 percentage points more likely to have a toilet and 33 percentage points more likely to have a flush toilet, and has 9 square meters of additional living space. This last point is striking in light of the likelihood that space is more expensive in urban areas. Finally, child mortality is 2.2 percentage points lower for urban households.

The overall pattern of the control variables is consistent with a story in which one more dependent causes the household to spend a bit more on housing but to sacrifice living standards along other dimensions, while one more working-age adult tends to be associated with improvements along all dimensions as long as the adult has some education, and dramatically so if he or she has university education, as does urban status.

We turn now to the main variable of interest, the foreign employment in the household's province, which recall is normalized by the province's 1989 population. There is a great deal of variance in the number of people employed by foreign enterprises, both across provinces and across time. For our purposes, the time-series variation is the most important, which we can measure as the standard deviation across provinces of the first difference in the foreign employment in a given province. This standard deviation is 0.14. We will interpret regression results in terms of this standard deviation. For example, in the first regression, with ownership of a television as the dependent variable, the coefficient on the normalized number of foreign-employed workers in the province is −0.102. Multiplying this by the standard deviation of the right-hand side variable gives $-0.102 \times 0.14 = -0.014$. This implies that a one-standard deviation increase in foreign employment on

Table 4
IV (1): effect of FDI on living standards.

Variables	(1) Elec	(2) Water	(3) Water_priv	(4) TV	(5) Radio	(6) Toilet	(7) Toilet_flush	(8) Livearea	(9) Chdead
Foreign-employed in province	−1.617*	0.398	0.405	−0.848***	0.173	−0.109	−0.383	59.95**	−0.0185
	(0.981)	(0.440)	(0.441)	(0.327)	(0.581)	(0.421)	(0.427)	(26.58)	(0.0878)
Size of household	−0.00781***	−0.00388***	−0.00316***	0.0239***	0.0105***	−0.0144***	−0.00949***	3.238***	0.00400**
	(0.00221)	(0.00120)	(0.00118)	(0.00349)	(0.00123)	(0.00301)	(0.00139)	(0.285)	(0.00179)
Adults without primary education	−0.0185***	−0.0128***	−0.0133***	−0.0322***	−0.00363	−0.0311***	−0.0483***	−1.219***	0.0336***
	(0.00321)	(0.00215)	(0.00210)	(0.00489)	(0.00247)	(0.00593)	(0.00317)	(0.390)	(0.00296)
Adults with primary school	0.0244***	−0.000145	−0.000229	0.0531***	0.0171***	0.0395***	0.0231***	2.806***	0.00205
	(0.00388)	(0.00220)	(0.00223)	(0.00578)	(0.00277)	(0.00581)	(0.00478)	(0.423)	(0.00217)
High-school graduates	0.0274***	0.0389***	0.0385***	0.0521***	0.0351***	0.0436***	0.0786***	6.335***	−0.00799***
	(0.00456)	(0.00357)	(0.00360)	(0.00869)	(0.00309)	(0.00617)	(0.00692)	(0.504)	(0.00189)
College graduates	0.0143***	0.0976***	0.0973***	0.0600***	0.0786***	0.0450***	0.144***	15.59***	−0.00953***
	(0.00350)	(0.00608)	(0.00598)	(0.00853)	(0.00451)	(0.00789)	(0.0198)	(0.607)	(0.00245)
Foreign-employed in household	0.0184	−0.00718	−0.00807	−0.0633***	−0.0299***	−0.00728	0.0430**	−6.092*	−0.00492**
	(0.0239)	(0.0128)	(0.0128)	(0.00559)	(0.00818)	(0.00550)	(0.0199)	(3.323)	(0.00236)
Urban	0.0681***	0.406***	0.403***	0.0852***	0.0159**	0.0679***	0.329***	8.902***	−0.0221***
	(0.00883)	(0.0244)	(0.0243)	(0.00863)	(0.00799)	(0.0121)	(0.0104)	(0.921)	(0.00300)
Observations	4,222,136	4,222,627	4,222,627	4,223,687	4,212,082	4,205,940	4,205,940	4,105,128	451,861
Prov &Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
1st stage *F*-stat	6.999	6.999	6.999	6.990	6.998	7.014	7.014	6.523	14.06
P-value	0.0114	0.0114	0.0114	0.0115	0.0114	0.0113	0.0113	0.0144	0.000536

Standard errors clustered at the province level in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

average is associated with a 1.4-percentage-point reduction in the fraction of local households who own a television, holding all controls constant.

Going through the regressions, there are five statistically significant coefficients. A one-standard-deviation increase in local hiring by multinationals lowers the probability of TV and radio ownership by 1.1 and 1.4 percentage points respectively (that is, -0.102×0.14 and -0.0773×0.14), and reduces living space by 1.5 square meters. On the other hand, the same change raises the probability of a flush toilet by 5.2 percentage points and lowers expected child mortality by a third of a percentage point. We see a mix of good and bad news, in other words. The picture is similarly mixed for a household that actually has an employee at one of the foreign enterprises, as the seventh row of the table shows.

We do not wish to pin too much on the OLS regressions because of the endogeneity problem. Table 4 reports the results for the IV version of the regression. Clearly, the negative findings for the number of foreign jobs in the province are greatly strengthened. Three variables are now statistically significant, two of which indicate a worsening of living standards when foreign hiring increases. The exception is living space, which increases by 8.4 square meters when foreign hiring goes up by one standard deviation – perhaps enough space for one small room. Access to electricity and a TV fall by about 23 and 12 percentage points respectively with a one-standard-deviation increase in foreign hiring. For households who have a member who gets one of the foreign-enterprise jobs, there are two bright spots – an increased probability of a flush toilet and a drop in child mortality – but the magnitudes are negligible, and there is no increase in living space. (It is possible that this is due to people moving into a dormitory to take a foreign-sector job. The results are essentially unchanged when households with a foreign-sector employee are removed from the sample). Note that the worsening of the estimates of the effect of foreign hiring on household welfare suggests that the first endogeneity story discussed in Section 2 fits better – omitted variables that improve living standards also attract FDI.

To sum up, *a rise in local hiring by multinationals is associated with slightly reduced living standards, even if the household itself has a member who takes one of the foreign jobs*.

We turn now to the results from estimation of Eq. (2), to see if we can infer anything about inequality. These results are reported for OLS in Table 5 and for the IV regression in Table 6, which are set up exactly as Tables 3 and 4, but the rows 8 through 11 are the interaction terms between the human capital measures and the province's foreign employment (*Foreign employed in province* × *adults w/o primary* is the interaction with the number of adults with less than primary education, and so forth). Once again, all regressions have province and year fixed effects and standard errors clustered at the province level.

The control variables have coefficients similar to their counterparts in Eq. (1). More non-working-age members cause the household to allocate resources toward living area and away from other uses. More education and living in the city both improve living standards including reducing child mortality. The effect of having a household member employed by a foreign employer has mixed effects on living standards, and is correlated with reduced living area.

In this case, it is more difficult to find any appreciable effect on living standards due to foreign hiring. In the OLS results, there is a small negative effect on access to electricity, significant only for workers with a primary education, and very small

Table 5
OLS (2): effect of FDI on living standards, heterogeneous effect with respect to education.

Variables	(1) Elec	(2) Water	(3) Water_priv	(4) TV	(5) Radio	(6) Toilet	(7) Toilet_flush	(8) Livearea	(9) Chdead
Foreign-employed in province	0.0997	0.0325	0.0396	−0.0120	−0.0453	0.0377	0.431***	−13.93	0.00408
	(0.0661)	(0.0343)	(0.0335)	(0.0497)	(0.0376)	(0.0278)	(0.0662)	(14.53)	(0.0149)
Size of household	−0.00730***	−0.00376***	−0.00304**	0.0246***	0.0104***	−0.0140***	−0.00887***	3.219***	0.00384**
	(0.00214)	(0.00137)	(0.00135)	(0.00342)	(0.00130)	(0.00296)	(0.00129)	(0.274)	(0.00176)
Adults without primary education	−0.0187***	−0.0145***	−0.0150***	−0.0350***	−0.00290	−0.0346***	−0.0479***	−1.312***	0.0375***
	(0.00309)	(0.00229)	(0.00226)	(0.00559)	(0.00196)	(0.00680)	(0.00329)	(0.474)	(0.00338)
Adults with primary school	0.0264***	−0.000708	−0.000705	0.0562***	0.0179***	0.0411***	0.0224***	2.691***	0.00253
	(0.00401)	(0.00239)	(0.00242)	(0.00534)	(0.00255)	(0.00601)	(0.00523)	(0.448)	(0.00229)
High-school graduates	0.0301***	0.0408***	0.0403***	0.0611***	0.0360***	0.0480***	0.0852***	6.359***	−0.00886***
	(0.00465)	(0.00423)	(0.00429)	(0.00771)	(0.00311)	(0.00645)	(0.00581)	(0.505)	(0.00187)
College graduates	0.0175***	0.106***	0.106***	0.0688***	0.0765***	0.0531***	0.174***	15.52***	−0.0110***
	(0.00404)	(0.00528)	(0.00540)	(0.00787)	(0.00541)	(0.00831)	(0.0145)	(0.442)	(0.00229)
Foreign-employed in household	0.00281	−0.00192	−0.00278	−0.0628***	−0.0261***	−0.00310	0.0367***	−5.569*	−0.00494**
	(0.00382)	(0.0182)	(0.0183)	(0.0128)	(0.00445)	(0.00204)	(0.0116)	(3.196)	(0.00212)
Foreign employed in province × adults w/o primary	0.0302	0.0271	0.0251	0.0636***	−0.0183	0.0676*	0.000661	0.719	−0.0495**
	(0.0220)	(0.0203)	(0.0188)	(0.0223)	(0.0212)	(0.0365)	(0.0224)	(6.036)	(0.0219)
Foreign employed in province × adults with primary	−0.0310**	0.00500	0.00355	−0.0627	−0.0149	−0.0359*	0.00787	1.829	−0.00533*
	(0.0149)	(0.00559)	(0.00595)	(0.0463)	(0.0164)	(0.0203)	(0.0127)	(4.930)	(0.00301)
Foreign employed in province × high-school graduates	−0.0543	−0.0263*	−0.0251	−0.148*	−0.0137	−0.0712*	−0.104	0.163	0.0138**
	(0.0325)	(0.0146)	(0.0153)	(0.0764)	(0.0185)	(0.0364)	(0.0741)	(3.900)	(0.00589)
Foreign employed in province × college graduates	−0.0416	−0.115***	−0.112***	−0.122	0.0257	−0.109**	−0.399**	1.095	0.0193
	(0.0283)	(0.0141)	(0.0142)	(0.0799)	(0.0165)	(0.0495)	(0.188)	(6.962)	(0.0146)
Urban	0.0654***	0.406***	0.402***	0.0829***	0.0165**	0.0666***	0.326***	8.957***	−0.0215***
	(0.00904)	(0.0246)	(0.0246)	(0.00889)	(0.00786)	(0.0122)	(0.0114)	(0.927)	(0.00283)
Observations	4,222,136	4,222,627	4,222,627	4,223,687	4,212,082	4,205,940	4,205,940	4,105,128	451,861
R-squared	0.142	0.363	0.364	0.158	0.077	0.201	0.341	0.127	0.021
Prov &Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors clustered at the province level in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

in magnitude (a one-standard-deviation increase in foreign hiring is associated with about a third of a percentage point decrease). For toilets, there is a minuscule increase in access for uneducated workers, and a similarly-sized drop for educated workers. There is a significant rise in probability of a flush toilet ($0.431 \times 0.14 = 0.09$,) of 9 percentage points per standard-deviation increase in foreign hiring, which disappears in households who have one university graduate – perhaps because those households already have a flush toilet regardless of foreign hiring. There are very small reductions in child mortality. However, most of these effects become insignificant in the IV regressions.

The effect of having a household member employed by a foreign enterprise, recorded in row 7, is very similar to what it was for Eq. (1); very small, and a mixed bag. Foreign employment improves access to a flush toilet by about half a percentage point.

To sum up, *a rise in local hiring by multinationals is associated with slightly reduced living standards, slightly less so for a household with very low education, and with small improvements if the household itself has a member who takes one of the foreign jobs*.

4. Allowing for heterogeneous effects

The effects of foreign hiring estimated above were almost uniformly quite small. Note that this cannot be because the data are simply noisy and uninformative, since a number of strong effects came through for other variables, such as household size, education, and urban location. Here we look more closely at some forms of heterogeneity that may have been obscuring the effects.

(i) Gender. We have not to this point paid any attention to gender. However, it is quite conceivable that male-led households and female-led households respond differently to the presence of foreign hiring. We do not have any meaningful indicator of household leader in our Census data, but we do have both the gender and the education level of each household member. In Table 7, we extend Eq. (2) to allow for a count of both male and female family members at each education level. The second row shows the effect of the number of male household members, and the third row the number of female

Table 6
IV (2): effect of FDI on living standards, heterogeneous effect with respect to education.

Variables	(1) Elec	(2) Water	(3) Water_priv	(4) TV	(5) Radio	(6) Toilet	(7) Toilet_flush	(8) Livearea	(9) Chdead
Foreign-employed in province	−2.763	0.761	0.767	−1.117	0.380	−0.0243	−0.577	96.75**	−0.00928
	(2.090)	(0.862)	(0.865)	(0.716)	(1.011)	(0.708)	(0.794)	(47.81)	(0.162)
Size of household	−0.00869***	−0.00341***	−0.00269**	0.0240***	0.0107***	−0.0140***	−0.00936***	3.274***	0.00383**
	(0.00253)	(0.00113)	(0.00111)	(0.00327)	(0.00113)	(0.00287)	(0.00168)	(0.273)	(0.00175)
Adults without primary school	−0.0418*	−0.00864	−0.00911	−0.0439***	0.000525	−0.0351***	−0.0560***	−0.521	0.0373***
	(0.0219)	(0.00805)	(0.00805)	(0.0101)	(0.00904)	(0.00847)	(0.00822)	(0.592)	(0.00482)
Adults with primary school	0.00135	0.00567	0.00567	0.0466***	0.0216**	0.0406***	0.0135	3.524***	0.00233
	(0.0240)	(0.00880)	(0.00882)	(0.0120)	(0.00981)	(0.00945)	(0.0102)	(0.709)	(0.00284)
High-school graduates	0.00869	0.0462***	0.0457***	0.0528***	0.0392***	0.0475***	0.0776***	7.064***	−0.00902***
	(0.0210)	(0.00852)	(0.00854)	(0.0121)	(0.00868)	(0.00912)	(0.0107)	(0.774)	(0.00236)
College graduates	−0.0106	0.113***	0.113***	0.0580***	0.0807***	0.0525***	0.164***	16.45***	−0.0112***
	(0.0272)	(0.0115)	(0.0116)	(0.0141)	(0.0113)	(0.0113)	(0.0208)	(0.719)	(0.00309)
Foreign-employed in household	−0.00317	−0.000398	−0.00127	−0.0651***	−0.0252***	−0.00323	0.0346***	−5.345*	−0.00500**
	(0.00532)	(0.0191)	(0.0192)	(0.0123)	(0.00542)	(0.00242)	(0.0120)	(3.175)	(0.00220)
Foreign employed in province × adults w/o primary	0.458	−0.0817	−0.0837	0.229**	−0.0819	0.0769	0.151	−13.38**	−0.0467
	(0.356)	(0.157)	(0.156)	(0.109)	(0.151)	(0.113)	(0.120)	(6.743)	(0.0419)
Foreign employed in province × adults with primary	0.422	−0.110	−0.112	0.112	−0.0823	−0.0261	0.168	−13.01*	−0.00265
	(0.405)	(0.149)	(0.149)	(0.163)	(0.159)	(0.111)	(0.137)	(7.464)	(0.0309)
Foreign employed in province × high-school graduates	0.330	−0.124	−0.123	−0.000219	−0.0708	−0.0628	0.0314	−12.38	0.0160
	(0.371)	(0.136)	(0.137)	(0.175)	(0.133)	(0.0937)	(0.164)	(7.643)	(0.0261)
Foreign employed in province × college graduates	0.404	−0.228	−0.225	0.0501	−0.0406	−0.0996	−0.242	−13.54	0.0222
	(0.421)	(0.146)	(0.149)	(0.194)	(0.159)	(0.111)	(0.280)	(8.411)	(0.0364)
Urban	0.0676***	0.405***	0.402***	0.0837***	0.0161**	0.0666***	0.327***	8.908***	−0.0215***
	(0.00891)	(0.0243)	(0.0243)	(0.00857)	(0.00795)	(0.0120)	(0.0111)	(0.916)	(0.00293)
Observations	4,222,136	4,222,627	4,222,627	4,223,687	4,212,082	4,205,940	4,205,940	4,105,128	451,861
Prov &Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
1st stage *F*-stat	3.652	3.653	3.653	3.649	3.649	3.655	3.655	3.981	5.410
P-value	0.0629	0.0628	0.0628	0.0629	0.0629	0.0627	0.0627	0.0525	0.0249

Robust standard errors clustered at the province level in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

household members. Similarly, each subsequent row corresponds to a row from Tables 5 and 6, but with the count of male members first and the corresponding count of female members next. As before, the table is estimated by IV, with province and year fixed effects and clustering at the provincial level.

Two striking points emerge. First, the variables for the two genders appear to have very similar effects. Almost throughout, the sign of the variables for men and women is the same and the magnitudes are similar. For example, one more boy in the household increases child mortality by 0.3 percentage points, and one more girl by 0.5 percentage points. One more man with a university degree reduces child mortality by 0.7 percentage points, and one more woman with the degree reduces it by 0.9 percentage points. Second, the effects of foreign hiring in the province are once again very weak. The only significant effects are very small increases in the probability of having a television, and reductions in living area. These do not differ by gender in any interesting way.

(ii) The average effect. In our main regressions, we controlled for the number of workers each household had who were employed by foreign employers, in order to isolate the direct effect of foreign employment from its indirect effect on the local labor market. However, if we wish to identify the *average* effect, it is desirable to do the estimation without controlling for the household's own foreign employment. It is also possible that trying to estimate the direct and indirect effect at the same time diluted the identification, resulting in only very small effects being observed. To address these issues, we also have performed the estimation without controlling for the household's own foreign-employed members. The results, for Eq. (1) with the IV and clustering as before, are reported in the first panel of Table 8, with only the right-hand-side variables of interest included.

The results show much the same story as before: Modest effects, indicating a slight drop in living standards. We find a 22 percentage-point reduction in access to electricity for the average household, and a small increase in living space of about 8 square meters, associated with a one-standard-deviation increase in foreign hiring. There is also a small drop in television ownership.

(iii) The urban–rural divide. Throughout, we have controlled for urban residence, but we have not allowed for the possibility that the *response* of an urban household to foreign hiring may be different from the response of a rural one. This

Table 7
IV (2): effect of FDI on living standards with gender controls.

Variables	(1) Elec	(2) Water	(3) Water_priv	(4) TV	(5) Radio	(6) Toilet	(7) Toilet_flush	(8) Livearea	(9) Chdead
Foreign-employed in province	−2.784	0.775	0.783	−1.119	0.382	−0.0178	−0.572	97.42**	−0.00257
Size of household – male	−0.01000***	−0.00430***	−0.00358***	0.0290***	0.0133***	−0.0155***	−0.0100***	3.338***	0.00305*
Size of household – female	−0.00784***	−0.00345***	−0.00276**	0.0193***	0.00844***	−0.0133***	−0.00969***	3.230***	0.00488***
Adults without primary school – male	−0.0428**	−0.0114	−0.0121*	−0.0512***	−0.00764	−0.0354***	−0.0603***	−1.734***	0.0195***
Adults without primary school – female	−0.0406	−0.00310	−0.00324	−0.0366***	0.00752	−0.0329***	−0.0493***	0.546	0.0525***
Adults with primary school – male	0.00253	−0.000621	−0.000987	0.0375***	0.0185**	0.0370***	0.00783	3.392***	−0.000428
Adults with primary school – female	0.000467	0.0155	0.0160	0.0562***	0.0241**	0.0464***	0.0225*	3.606***	0.00875*
High-school graduates – male	0.00935	0.0295***	0.0286***	0.0466***	0.0380***	0.0451***	0.0648***	7.000***	−0.00866***
High-school graduates – female	0.00841	0.0663***	0.0664***	0.0591***	0.0396***	0.0515***	0.0937***	7.072***	−0.00518
College graduates – male	−0.00417	0.111***	0.110***	0.0479***	0.0828***	0.0473***	0.151***	17.04***	−0.00705***
College graduates – female	−0.0172	0.117***	0.118***	0.0683***	0.0777***	0.0593***	0.180***	15.81***	−0.00884*
Foreign-employed in household	−0.00605	−0.00226	−0.00321	−0.0661***	−0.0248***	−0.00414	0.0320***	−5.251*	−0.00606**
Foreign employed in province × adults w/o primary – male	0.396	−0.0717	−0.0735	0.190**	−0.0751	0.0684	0.118	−12.37**	−0.0281
Foreign employed in province × adults w/o primary – female	0.530	−0.0980	−0.100	0.267**	−0.0898	0.0818	0.182	−14.73*	−0.0604
Foreign employed in province × adults with primary – male	0.367	−0.0973	−0.0985	0.101	−0.0732	−0.0214	0.153	−10.95*	−0.00230
Foreign employed in province × adults with primary – female	0.488	−0.130	−0.132	0.124	−0.0924	−0.0343	0.179	−15.39*	−0.00736
Foreign employed in province × high-school graduates – male	0.318	−0.105	−0.104	0.0146	−0.0778	−0.0539	0.0599	−11.98*	0.0143
Foreign employed in province × high-school graduates – female	0.344	−0.150	−0.149	−0.0159	−0.0634	−0.0745	−0.00316	−12.83	0.0109
Foreign employed in province × college graduates – male	0.374	−0.220*	−0.216*	0.0486	−0.0676	−0.0858	−0.219	−13.53	0.0164
Foreign employed in province × college graduates – female	0.443	−0.241	−0.239	0.0516	−0.0128	−0.117	−0.268	−13.61	0.0176
Urban	0.0674***	0.404***	0.400***	0.0835***	0.0163**	0.0662***	0.326***	8.932***	−0.0203***
Observations	4,222,136	4,222,627	4,222,627	4,223,687	4,212,082	4,205,940	4,205,940	4,105,128	451,861
Prov &Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
1st stage *F*-stat	3.603	3.605	3.605	3.601	3.601	3.607	3.607	3.935	4.585
P-value	0.0646	0.0645	0.0645	0.0646	0.0646	0.0644	0.0644	0.0538	0.0381

Robust standard errors clustered at the province level. They are omitted due to space issue.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Table 8
Heterogenous effects: average effect and urban–rural divide.

Variables	(1) Elec	(2) Water	(3) Water_priv	(4) TV	(5) Radio	(6) Toilet	(7) Toilet_flush	(8) Livearea	(9) Chdead
Average effect									
Foreign-employed in province	−1.607*	0.395	0.401	−0.881***	0.157	−0.113	−0.360	56.76**	−0.0202
	(0.969)	(0.444)	(0.445)	(0.328)	(0.575)	(0.418)	(0.424)	(25.98)	(0.0874)
Observations	4,222,136	4,222,627	4,222,627	4,223,687	4,212,082	4,205,940	4,205,940	4,105,128	451,861
1st stage *F*-stat	7.129	7.129	7.129	7.120	7.129	7.144	7.144	6.604	14.35
P-value	0.0107	0.0107	0.0107	0.0108	0.0107	0.0107	0.0107	0.0138	0.000477
Urban sample									
Foreign-employed in province	−0.396*	−0.163	−0.132	−0.667**	−0.0476	−0.337	−2.025***	50.19*	−0.133**
	(0.236)	(0.397)	(0.398)	(0.338)	(0.395)	(0.209)	(0.620)	(26.32)	(0.0517)
Observations	1,273,098	1,273,322	1,273,322	1,273,614	1,269,085	1,270,779	1,270,779	1,234,713	208,280
1st stage *F*-stat	9.215	9.220	9.220	9.225	9.220	9.245	9.245	10.27	18.43
P-value	0.00411	0.00410	0.00410	0.00409	0.00410	0.00406	0.00406	0.00258	0.000102
Rural sample									
Foreign-employed in province	−3.169	0.917	0.846	−0.897**	0.638	0.0471	2.925**	98.20*	0.271
	(2.635)	(0.833)	(0.815)	(0.376)	(0.975)	(0.488)	(1.416)	(55.45)	(0.270)
Observations	2,949,038	2,949,305	2,949,305	2,950,073	2,942,997	2,935,161	2,935,161	2,870,415	243,581
1st stage *F*-stat	3.959	3.955	3.955	3.941	3.956	3.962	3.962	2.913	7.199
P-value	0.0532	0.0533	0.0533	0.0537	0.0533	0.0531	0.0531	0.0952	0.0104

Robust standard errors clustered at the province level in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

Table 9
Effects of FDI on inter-provincial migration, first-differenced between 1999 and 2009.

Variables	(1) OLS (1)	(2) OLS (2)	(3) IV (1)	(4) IV (2)
Number of foreign-employed in province	4.804***	8.039***	5.105***	7.092**
	(0.911)	(1.916)	(1.495)	(3.203)
Mean size of household	103,700	38,603	89,731	91,206
	(382,921)	(418,970)	(345,977)	(383,607)
Mean adults without primary education	103,834	350,945	117,768	262,701
	(574,482)	(636,100)	(514,941)	(592,674)
Mean adults with primary education	19,616	170,370	11,958	125,561
	(468,006)	(455,295)	(418,045)	(403,722)
Mean high-school graduates	633,268	893,741	591,380	914,568*
	(608,354)	(609,347)	(569,245)	(514,659)
Mean college graduates	2.409e+06	1.555e+06	2.242e+06	1.672e+06
	(1.567e+06)	(1.565e+06)	(1.560e+06)	(1.356e+06)
Mean foreign-employed in household	−3.255e+06**	−4.486e+06*	−3.616e+06*	−4.082e+06**
	(1.266e+06)	(1.589e+06)	(1.883e+06)	(1.782e+06)
Mean foreign employed in province		−1.147e+06		−1.165e+06
× adults without primary school		(2.685e+06)		(2.252e+06)
Mean foreign employed in province		6.062e+06*		5.514e+06*
× adults with primary school		(3.508e+06)		(3.350e+06)
Mean foreign employed in province		−3.568e+07**		−3.210e+07*
× high-school graduates		(1.556e+07)		(1.672e+07)
Mean foreign employed in province		2.930e+07*		2.810e+07**
× college graduates		(1.487e+07)		(1.295e+07)
Mean urban	150,513	543,075	175,586	412,144
	(432,472)	(484,559)	(399,095)	(558,489)
Observations	43	43	43	43
R-squared	0.858	0.890	0.858	0.889
1st stage *F*-stat			14.20	10.08
P-value			0.000625	0.00345

Standard errors in parentheses.
* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

could be crucial: Given that foreign hiring is concentrated in the urban areas, it may well be that all of the response in concentrated in the urban areas, and by pooling all households we have obscured the effect. The two remaining panels of Table 8 show, respectively, the estimation results for the sample of rural households only, and urban households only. Once again, this is Eq. (1), with IV and clustering as before, and the other regressors suppressed to save space.

The urban results are indeed stronger than the rural ones, but, perhaps surprisingly, they are stronger in a negative direction. Most strikingly, the probability of having a flush toilet rises by 41 percentage points for a rural household with a one-standard-deviation increase in the province's foreign hiring, while for an urban household the same probability falls by 28 percentage points. For an urban household, the probability of connection to electricity falls by 6 percentage points, while the effect for a rural household is very imprecisely estimated.

The results are surprising and somewhat enigmatic, but they certainly show that the failure to find beneficial effects of foreign hiring is not due to pooling of rural and urban households.

5. Migration

As a final exercise, we look at the effect of FDI on the movement of people. If FDI raises living standards in a province, and mobility is not prohibitively costly, it is likely that the population of the province will respond as a result, as people move to that province to take advantage of the new opportunities. This can be an alternative test for living standards effects; if people vote with their feet, they may reveal living-standards effects indirectly that are difficult to measure directly.

Table 9 shows the results of regressing the change in province i's population between 1999 and 2009 on the increase in foreign employment in province i between the same two years. The first two columns show the results from OLS, while the remaining two show IV regressions. In each case, we control for the first differences of provincial characteristics. which are merely the province-wide means of the variables in Eqs. (1) and (2): average household size; average number of members of each educational group per household; average number of foreign-employed members per household; and (for columns 2 and 4) the interactions between the educational means and the aggregate foreign employment. In this case, the first-stage F-statistic is well above 10. In all four regressions, the coefficient on aggregate foreign hiring is strongly significant, ranging from about 5 to about 8. The implication is that each 1000 people hired by foreign firms in province i results in at least 5000 people moving to province i from other locations.

This can be taken as indirect evidence of strong beneficial effects on local welfare from the foreign hiring, in contrast to the micro evidence we have seen to this point. An alternative interpretation is that this finding is a possible *explanation* for the absence of beneficial effects in the main regressions: If people are sufficiently mobile across provinces, any difference in real incomes across locations can be arbitraged away by mobility. However, this interpretation is not terribly plausible; it would fly in the face of large differences in real income effects across provinces due to trade shocks as measured by McCaig (2011), for example (as well as other studies of similar changes for other countries – for example, see Kovak, 2013 for a similar case in Brazil). For now, we are left with a paradox.

6. Concluding remarks

We have investigated the effect of FDI, measured by hiring by foreign enterprises, on standards of living and inequality in Vietnam. Our sample is a random draw from the Vietnamese decennial census, which gives us a series of cross sections of the population. Using the full, repeated cross-section sample, after correcting for the endogeneity of FDI, we find consistently that increased foreign hiring in a province is associated with small reductions in living standards for households whose members are not employees of the foreign firms. In particular, once endogeneity of FDI is controlled for, access to electricity falls by more than 20 percentage points when local foreign hiring rises by one standard deviation. Whether this reflects extra strain on the local power grid due to extra demand for power by multinationals, or some other mechanism, is a question beyond our ability to answer within this study. Workers hired by the foreign firms see very minor increases in living standards. The results are changed in details but not in their broad contours when we allow for heterogeneous response by education level, gender, or rural/urban status.

However, the failure to find benefits for the local population from FDI could stem from a number of sources. In our main regressions, our instrumental variables are on the weak side at best. We are limited in our geographic detail to the province only; it would be desirable to have metropolitan areas or commuting zones, but these are not available in the Vietnamese Census. This may mask crucial geographic variation and stymie identification. (However, McCaig, 2011 found large effects of trade shocks at the provincial level). In addition, we find large changes in provincial population associated with increases in foreign hiring, which suggest that there may be welfare benefits that we are failing to measure.

A number of studies of the effects of globalization on Vietnamese workers and families have found great benefits. Brambilla et al. (2012), Edmonds and Pavcnik (2005), McCaig (2011) all show tangible benefits to Vietnamese households from increased export opportunities. This paper is an attempt to see if similar benefits extend to inward FDI. One lesson from the exercise is that effects of FDI are harder to measure than the effects of those trade policies, because of the endogeneity of FDI flows and the difficulty of finding effective instruments. Another is that the welfare benefits of trade openness found in those studies may well not be replicated by an infusion of FDI. This could be offered as a word of caution to policy makers who would hope that opening the door to increased FDI would in and of itself be a powerful anti-poverty program in Vietnam.

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