Online Appendix

Supplementary material

for

Informal employment in a growing and globalizing low-income country

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(for online publication only)

This document contains further details about the data and analysis discussed in the paper. The first part provides additional data description. The second part briefly summarizes additional tables and results.

Data Description

Census data

We use data from the 1999 and 2009 Vietnamese population censuses made available through IPUMS-International (Minnesota Population Center 2014). These datasets are a 3 and 15 percent sample drawn from the full population in 1999 and 2009 respectively. The censuses collected information on demographics, education, current province of residence, province of residence five years ago, and employment. The reference period for employment is the past 12 months for the 1999 census and the previous week for the 2009 census. The employment modules collected information on the industry of affiliation (based on an adaptation of 3-digit ISIC), occupation (based on ISCO-88), and ownership category (self-employed, working for other households, state-owned economic sector, collective economic sector, private economic sector, foreign-invested sector).

Our analysis of working in the informal sector focuses on being self-employed or working for a household business or farm as opposed to working in the registered, enterprise sector.[1] In Vietnam, state, foreign, and collective firms are legally required to register as an enterprise, whereas domestic private firms may legally operate as either an enterprise or a household business. Our definition of informality is thus based on the registration status rather

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[1] The 1999 census estimates suggest a large share of agricultural workers in collectives. This is inconsistent with estimates from other datasets from a similar time period (e.g., 2002 VHLSS) as well as the 2009 census. Thus, to be consistent across data source we classify all such workers as informal.

than employment conditions within a firm.[2] Firms in the enterprise sector face different

regulations such as formal accounting requirements and compulsory social insurance

contributions (see McCaig and Pavcnik 2014). The differences in regulations between the

household business and enterprise sectors closely correspond to the notion of informality used in

the literature (see La Porta and Shleifer 2014).

We focus on workers ages 20-64 at the time of the census. By age 20 most individuals in

Vietnam have finished school as only 0.4 and 2 percent of 20 year olds in 1999 and 2009

respectively were still attending school based on census estimates. Table A1 displays summary

statistics for the two censuses pooled together. All estimates are weighted. We present three

samples: all workers, informal workers, and formal workers.

Household survey data

We use four nationally representative household surveys, the 2002, 2004, 2006, and 2008

Vietnam Household Living Standards surveys (VHLSSs), which were conducted by the General

Statistics Office (GSO) of Vietnam. Our datasets include approximately 74,000 households in

2002 and 46,000 households in 2004, 2006, and 2008.[3] A valuable feature of the surveys is the

inclusion of a rotating panel such that we have three two-survey panels that each feature around

21,000 to 22,000 households and two three-survey panels that each feature around 10,000

households.

The surveys collected information on demographics, education, and employment. The

employment modules focused on jobs worked during the past 12 months and collected

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[2] Wage-earning informal workers earn lower wages and benefits than observationally equivalent workers in the formal sector. In addition, households headed by an informal worker tend to have lower per capita income than observationally equivalent households headed by a formal worker (McCaig and Pavcnik 2014).

[3] For additional information on the surveys please refer to Phung Duc Tung and Nguyen Phong (n.d.) and General Statistics Office (2008).

information on the industry of affiliation (based on an adaptation of 2-digit ISIC), occupation (based on ISCO-88), ownership category (self-employed, working for other households, state-owned economic sector, collective economic sector, private economic sector, foreign-invested sector), hours worked during the past 12 months, number of years doing the job (not available in the 2002 VHLSS), and wages and other benefits. We focus our analysis on the most time-consuming job. As is the case with the census data, our analysis of working in the informal sector focuses on being self-employed or working for a household business or farm as opposed to working in the registered, enterprise sector.[4]

We focus on workers ages 20-64 including individuals that may be working part time. Table A2 displays summary statistics for the four surveys pooled together. We present three samples: all workers, informal workers, and formal workers.

Supplementary Results

Supplementary Material for Introduction

Table A3 summarizes aggregate statistics about Vietnam's labor force in 1999 and 2009. The table summarizes the total labor force by four broad sectors of the economy and the contribution of each sector to total employment. In addition, the table reports the share of informal employment and the share of employment in FDI firms. Over the decade, Vietnam experienced a 35 percent increase in the workforce. At the same time, the percentage of the Vietnamese workforce employed in the informal sector dropped from 86 to 79. This drop reflects a relative contraction of employment in agriculture and an expansion of manufacturing and services, as well as a drastic drop in the share of informal jobs from 58 to 43 percent within

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[4] Self-employment includes self-employment in a private enterprise. The 2002 VHLSS does not separately identify self-employment in a private enterprise from self-employment in a household business, although the latter surveys do. Thus, to be consistent across surveys we group all self-employed individuals in the informal sector. Self-employment in the private sector is only 0.7 percent of total self-employment in 2004 (McCaig and Pavcnik 2014).

manufacturing. In contrast, the share of informal employment within agriculture and services remains relatively stable. The table also illustrates the large expansion of FDI in manufacturing. While the economy-wide percentage of employment in FDI firms increases from 0.5 to 3.4, it remains low. All sectors experience an increase in FDI presence. However, FDI presence increases most in manufacturing, where employment accounted for by FDI firms jumps from 5 to 22 percent.

The bottom panel of Table A3 provides these same statistics for the five provinces in Vietnam that are the most integrated internationally as a result of port infrastructure and pre-existing manufacturing industry structure (Ho Chi Minh City, Ha Noi, Hai Phong, Dong Nai, and Binh Duong). The table highlights the higher employment share of manufacturing in these provinces, lower informality rate, and higher incidence of FDI employment. For example, these five key provinces account for almost 50 percent of Vietnam's manufacturing jobs and 85 percent of FDI jobs in 1999.

Supplementary material for section II

Table A4 provides supplementary material on the role of birth cohorts in the aggregate decline in informality shown in Table 1 in the main text. Table A4 examines the role of birth cohorts in the decline in aggregate share of informal employment by gender. Overall, men and women exhibit similar informality rates, but this masks gender differences in informality within birth cohorts. The share of informal employment is lower among younger women than among younger men, but higher among older women than older men. Within manufacturing, women are less likely to work in the informal sector than women, and this mainly reflects lower share of informal employment among younger women relative to younger men.

The analysis in Table A4 confirms the economy-wide and manufacturing trends highlighted in the main text. However, there are some interesting differences across gender. In particular, the differences in informality across cohorts are larger for women than for men. However, the within cohort declines in informality are larger for men than for women. Panel B of Table A4 reports the decomposition of the aggregate decline in informality into the between and within cohort change and confirms the gender differences in the relative contribution of the two channels. Within cohort changes contributed 53 percent toward the economy-wide decline in the share of informal employment for men. In contrast, within cohort changes contribute only 7 percent toward the economy-wide decline in the share of informal employment for women, with workforce shifts across cohorts accounting for the vast majority of the informality decline among women. As is the case with the pooled sample, workforce shifts between cohorts play a more important role in declines in informal employment in manufacturing, particularly among women. This likely reflects the large young cohort of women that enters the labor force with very low rates of informality.

Table A5 reports the share of workers that migrate and the share of informal employment among these workers by birth cohort. Overall, 4.6 percent of workers in 2009 migrate, but 66 percent of them reside in the five key provinces. Migration significantly increases over the decade of growth, particularly for the youngest cohort, from 5.6 percent to 11.6 percent. However, migration is less prevalent with age. Importantly, within each cohort, migrants are much less likely to work informally. For example, in 2009, 72 percent of the workers in the youngest cohort are employed in the informal sector (Table 1), as compared to only 32 percent of migrants in this cohort (Table A5).

Table A6 reports the migration analysis by gender. This analysis confirms the trends in the economy-wide and manufacturing samples and does not suggest large differences in migration rates between men and women that work. However, women migrants are less likely to work in the informal sector than men, driven by substantially lower informality rates among young migrant women in manufacturing.

Supplementary material for section III

This section briefly summarizes the evidence consistent with sorting of individuals into the formal and informal sectors. It examines worker characteristics that are associated with a greater probability of working in the informal sector using cross-sectional data, a common approach in the literature. In particular, we regress the indicator for whether an individual works in the informal sector on age cohort indicators (25-29, 30-39, 40-49, 50-64 (20-24 is the excluded category)), a female indicator, an ethnic minority indicator, education indicators (complete primary, complete lower secondary, complete upper secondary (no completed schooling is the excluded category)), an indicator for whether the individual lives in urban area, and occupation, industry, province, and year fixed effects. Table A7 reports the results in column 1. We find evidence of sorting of workers into the formal and informal sector based on education. Workers in the formal sector tend to be better educated than otherwise observationally equivalent workers in the informal sector. They are also more likely to be younger, male, and to reside in urban areas than workers in the informal sector. The analysis that focuses on manufacturing (column 2) and the five key provinces (column 3) yields similar conclusions. The one exception is the role of gender. Within manufacturing, women are less likely to work in the informal sector relative to observationally equivalent men. In the five key provinces, women are

also less likely to work in the informal sector than men, likely due to high concentration of manufacturing in these areas.

We complement the analysis of sorting based on switchers from informal to formal sector from the main text (Table 3) by examining sorting in switching of individuals from the formal to the informal sector. We confine the sample to all workers in the panel that initially work in the formal sector and use an indicator for whether a worker works in the informal sector at the end of the panel as the dependent variable. The results reported in column 1 of Table A8 suggest that switching to the informal sector is more predictable (R^2 of 0.27) than switching to the formal sector (see Table 3 in main text) and supports sorting by education, age, and residence. Less educated, older, and rural workers are more likely to switch to the informal sector. Relative to workers that remain in the formal sector, workers that switch to the informal sector tend to have more similar education, age, and residence to workers already working in the informal sector. However, women are less likely to switch to the informal sector, even though women are more likely to work in the informal sector.[5]

Supplementary material for section IV

Table A9 provides further support for occupation upgrading by focusing on workers that move. The sample is based on workers from the household surveys that left the household and reported leaving for work reasons. This information is available in the 2006 and 2008 VHLSSs. Recall from section I that migration is associated with a higher degree of formalization. The occupational structure after the move shifted away from elementary occupations toward skilled occupations (especially skilled handicrafts and manual occupations), assemblers, machinists, staff, and professionals relative to the start of the sample.

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[5] This might be related to the type of jobs women and men hold in the formal sector. Women are more likely to be employed in FDI manufacturing than men, and thus less likely to voluntarily leave the formal sector to the extent that FDI jobs are considered more desirable than other formal jobs.

References

General Statistics Office. 2008. "Operational Handbook: Vietnam Household Living Standard Survey 2008," Ha Noi.

Phung Duc Tung, and Nguyen Phong. (n.d.) "Vietnam Household Living Standards Survey (VHLSS), 2002 and 2004: Basic Information."

Table A1: Descriptive statistics for census data

	All workers	Informal sector workers	Formal sector workers
Age group			
Age 20-24	0.155	0.149	0.182
Age 25-29	0.169	0.158	0.219
Age 30-39	0.306	0.305	0.308
Age 40-49	0.229	0.234	0.206
Age 50-64	0.142	0.154	0.085
Census year			
1999	0.425	0.447	0.324
2009	0.575	0.553	0.676
Female	0.480	0.482	0.474
Urban	0.258	0.188	0.580
Migrated during past 5 years	0.040	0.025	0.110
Industry			
Agriculture, forestry, hunting, and fisheries	0.587	0.707	0.037
Mining	0.006	0.003	0.020
Manufacturing	0.116	0.068	0.338
Services	0.290	0.222	0.605
Weighted number of workers	73,521,501	60,401,292	13,120,209
Number of observations	7,919,668	6,525,112	1,394,556

Notes: Authors' calculations based on the 1999 and 2009 Vietnamese population censuses.

Table A2: Descriptive statistics for household survey data

	All workers	Informal sector workers	Formal sector workers
Age group			
Age 20-24	0.133	0.123	0.176
Age 25-29	0.126	0.112	0.182
Age 30-39	0.280	0.284	0.262
Age 40-49	0.278	0.282	0.263
Age 50-64	0.184	0.199	0.117
Survey			
2002	0.234	0.241	0.203
2004	0.240	0.240	0.237
2006	0.242	0.242	0.243
2008	0.284	0.276	0.316
Highest level of completed education			
No completed education	0.198	0.235	0.037
Primary education	0.281	0.318	0.119
Lower secondary education	0.303	0.323	0.221
Upper secondary education	0.218	0.125	0.623
Female	0.501	0.516	0.437
Ethnic minority	0.127	0.144	0.050
Urban	0.248	0.186	0.513
Occupation			
Armed forces	0.004	0.000	0.020
Legislators, senior officials and managers; professionals	0.046	0.003	0.233
Technicians and associate professionals	0.037	0.003	0.182
Clerks	0.016	0.001	0.080
Skilled workers	0.177	0.163	0.236
Plant and machine operators and assemblers	0.029	0.018	0.073
Elementary occupations	0.692	0.811	0.176
Weighted number of workers	152,461,517	123,863,155	28,598,363
Number of observations	442,643	366,794	75,849

Notes: Authors' calculations based on the VHLSS.

Table A3: Summary of workforce across broad industry groups

	Number of workers (000s)		Sectoral share of workforce		Share of workers within the sector in the informal sector		Share of workers within the sector in foreign-invested firms	
	1999	2009	1999	2009	1999	2009	1999	2009
Panel A: All workers								
Agriculture	21,202	21,984	0.679	0.520	0.987	0.990	0.000	0.000
Mining	170	275	0.005	0.007	0.409	0.433	0.003	0.012
Manufacturing	2,769	5,777	0.089	0.137	0.580	0.435	0.050	0.220
Services	7,083	14,240	0.227	0.337	0.617	0.633	0.003	0.011
Total	31,223	42,276	1.000	1.000	0.864	0.790	0.005	0.034
Panel B: Key provinces								
Agriculture	2,277	1,902	0.381	0.202	0.976	0.974	0.001	0.002
Mining	16	22	0.003	0.002	0.269	0.390	0.015	0.049
Manufacturing	1,301	2,741	0.218	0.291	0.437	0.293	0.090	0.336
Services	2,384	4,754	0.399	0.505	0.602	0.577	0.007	0.025
Total	5,979	9,419	1.000	1.000	0.708	0.574	0.023	0.111

Notes: Authors' calculations from the 1999 and 2009 Censuses. The key provinces include Ho Chi Minh City, Ha Noi, Hai Phong, Dong Nai, and Binh Duong.

Table A4: Informality across and within birth age cohorts by gender

| | Men | | | | | | Women | | | | | |
| | Economy-wide | | | Manufacturing | | | Economy-wide | | | Manufacturing | | |

Panel A: Share of informal workers in age cohorts

Cohort age in 1999	1999	2009	Change	1999	2009	Change	1999	2009	Change	1999	2009	Change
Age 10 to 14		0.766			0.355			0.661			0.235	
Age 15 to 19		0.709			0.356			0.663			0.297	
Age 20 to 24	0.898	0.761	-0.137	0.655	0.462	-0.193	0.848	0.760	-0.088	0.511	0.419	-0.092
Age 25 to 29	0.873	0.808	-0.064	0.639	0.543	-0.095	0.854	0.826	-0.028	0.528	0.509	-0.019
Age 30 to 34	0.869	0.828	-0.041	0.626	0.593	-0.033	0.866	0.858	-0.008	0.544	0.577	0.033
Age 35 to 39	0.842	0.811	-0.031	0.576	0.590	0.014	0.858	0.861	0.003	0.540	0.637	0.097
Age 40 to 44	0.823	0.808	-0.015	0.575	0.622	0.047	0.854	0.890	0.036	0.500	0.733	0.233
Age 45 to 49	0.831	0.846	0.015	0.604	0.691	0.087	0.858	0.968	0.110	0.561	0.862	0.302
Age 50 to 54	0.843	0.926	0.083	0.617	0.798	0.181	0.903	0.985	0.082	0.583	0.931	0.348
Age 55 to 59	0.874			0.680			0.977			0.847		
Age 60 to 64	0.948			0.818			0.990			0.984		
Total	0.862	0.787	-0.075	0.623	0.469	-0.154	0.866	0.793	-0.072	0.531	0.401	-0.130

Panel B: Decomposition of aggregate informality change 2009-1999

	Within cohorts	Between cohorts	Total change	Within cohorts	Between cohorts	Total change	Within cohorts	Between cohorts	Total change	Within cohorts	Between cohorts	Total change
Decomposition	-0.040	-0.035	-0.075	-0.044	-0.110	-0.154	-0.005	-0.068	-0.072	0.014	-0.144	-0.130

Notes: Authors' calculations based on workers ages 20-64 from the 1999 and 2009 Censuses.

Table A5: Informality across and within birth age cohorts among recent migrants

Cohort age in 1999	Economy-wide				Manufacturing			
	Share of workers within cohort that migrated		Share of migrants in the informal sector		Share of workers within cohort that migrated		Share of migrants in the informal sector	
	1999	2009	1999	2009	1999	2009	1999	2009
Age 10 to 14		0.116		0.317		0.288		0.106
Age 15 to 19		0.084		0.356		0.200		0.130
Age 20 to 24	0.056	0.044	0.604	0.473	0.165	0.118	0.324	0.192
Age 25 to 29	0.043	0.028	0.662	0.562	0.106	0.078	0.394	0.223
Age 30 to 34	0.028	0.019	0.750	0.630	0.063	0.056	0.472	0.250
Age 35 to 39	0.022	0.015	0.781	0.670	0.044	0.042	0.604	0.290
Age 40 to 44	0.020	0.012	0.775	0.720	0.035	0.029	0.543	0.348
Age 45 to 49	0.017	0.010	0.798	0.787	0.033	0.027	0.617	0.412
Age 50 to 54	0.015	0.007	0.834	0.819	0.020	0.017	0.516	0.435
Age 55 to 59	0.013		0.841		0.029		0.651	
Age 60 to 64	0.008		0.937		0.025		0.883	
Total	0.031	0.046	0.695	0.418	0.091	0.154	0.397	0.143

Notes: Authors' calculations based on workers ages 20-64 from the 1999 and 2009 Census.

Table A6: Informality across and within birth age cohorts among recent migrants by gender

	Economy-wide				Manufacturing			
	Share of workers within cohort that migrated		Share of migrants in the informal sector		Share of workers within cohort that migrated		Share of migrants in the informal sector	
Cohort age in 1999	1999	2009	1999	2009	1999	2009	1999	2009
PANEL A: MEN								
Age 10 to 14		0.096		0.326		0.276		0.144
Age 15 to 19		0.084		0.356		0.208		0.153
Age 20 to 24	0.053	0.049	0.678	0.472	0.149	0.127	0.436	0.219
Age 25 to 29	0.048	0.031	0.691	0.552	0.104	0.080	0.479	0.249
Age 30 to 34	0.032	0.021	0.745	0.605	0.061	0.054	0.487	0.289
Age 35 to 39	0.026	0.016	0.753	0.624	0.050	0.039	0.629	0.299
Age 40 to 44	0.024	0.013	0.748	0.647	0.031	0.027	0.532	0.325
Age 45 to 49	0.019	0.010	0.763	0.723	0.029	0.029	0.573	0.416
Age 50 to 54	0.019	0.009	0.814	0.735	0.013	0.022	0.604	0.321
Age 55 to 59	0.016		0.799		0.035		0.606	
Age 60 to 64	0.010		0.941		0.022		0.811	
Total	0.034	0.045	0.720	0.424	0.079	0.146	0.485	0.178
PANEL B: WOMEN								
Age 10 to 14		0.138		0.309		0.297		0.079
Age 15 to 19		0.085		0.357		0.193		0.109
Age 20 to 24	0.058	0.039	0.537	0.475	0.176	0.110	0.261	0.161
Age 25 to 29	0.038	0.025	0.620	0.576	0.107	0.076	0.304	0.192
Age 30 to 34	0.024	0.018	0.757	0.662	0.065	0.059	0.454	0.207
Age 35 to 39	0.018	0.014	0.824	0.727	0.036	0.046	0.557	0.279
Age 40 to 44	0.017	0.011	0.816	0.806	0.041	0.032	0.556	0.375
Age 45 to 49	0.015	0.009	0.850	0.860	0.040	0.024	0.667	0.405
Age 50 to 54	0.011	0.006	0.869	0.939	0.031	0.010	0.446	0.741
Age 55 to 59	0.009		0.927		0.013		1.000	
Age 60 to 64	0.006		0.929		0.034		1.000	
Total	0.028	0.047	0.663	0.411	0.104	0.163	0.322	0.113

Notes: Authors' calculations based on workers ages 20-64 from the 1999 and 2009 censuses.

Table A7: Probability of working in the informal sector

	All	Manufacturing	Key Provinces
	(1)	(2)	(3)
Age 25-29	0.006***	0.060***	0.016***
	(0.001)	(0.006)	(0.006)
Age 30-39	0.031***	0.161***	0.069***
	(0.001)	(0.005)	(0.005)
Age 40-49	0.036***	0.214***	0.085***
	(0.001)	(0.006)	(0.005)
Age 50-64	0.048***	0.276***	0.118***
	(0.001)	(0.007)	(0.006)
Female	0.002**	-0.024***	-0.008**
	(0.001)	(0.004)	(0.003)
Ethnic minority	0.002	0.008	0.007
	(0.001)	(0.012)	(0.016)
Primary education	-0.000	-0.023***	-0.022***
	(0.001)	(0.006)	(0.005)
Lower secondary	-0.018***	-0.079***	-0.063***
	(0.001)	(0.007)	(0.006)
Upper Secondary	-0.076***	-0.182***	-0.134***
	(0.001)	(0.007)	(0.006)
Urban	-0.021***	-0.040***	-0.022***
	(0.001)	(0.004)	(0.004)
Observations	442,591	50,139	49,052
R-squared	0.629	0.352	0.567

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notes: The sample is all workers age 20 to 64 at the time of the survey. All regressions include year, province, industry, and occupation fixed effects. The key provinces are Ho Chi Minh City, Ha Noi, Hai Phong, Dong Nai, and Binh Duong.

Table A8: Switching to informal sector

Age 25-29	-0.020**
	(0.009)
Age 30-39	-0.025***
	(0.008)
Age 40-49	-0.031***
	(0.009)
Age 50-64	0.053***
	(0.011)
Female	-0.013**
	(0.006)
Ethnic minority	0.008
	(0.012)
Primary education	-0.094***
	(0.014)
Lower secondary	-0.174***
	(0.014)
Upper Secondary	-0.264***
	(0.014)
Urban	-0.041***
	(0.006)
Observations	19,098
R-squared	0.266

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sample is all 2-survey panel individuals that worked in both surveys and were 20-64 years old and formal at the start of the panel. The regression also includes occupation, province, industry, and survey-year fixed effects.

Table A9: Occupational composition and changes among movers

	Movers	
	Start	Change
Elementary occupations	0.634	-0.256
Skilled workers	0.249	0.182
Technicians and associate professionals	0.029	0.009
Clerks	0.018	0.005
Armed forces	0.006	0.007
Plant and machine operators and assemblers	0.037	0.028
Legislators, senior officials and managers; professionals	0.028	0.026

Notes: The table reports the share of employment in an occupation at the start of the sample and subsequent change in this share. Skilled workers occupation includes service workers and shop and market sales workers; skilled agricultural and fishery workers; and craft and related trades workers. The information on occupations of workers that left the household is only available in the 2006 and 2008 VHLSSs.