

Worker Turnover and Job Reallocation: Evidence from Matched Employer-Employee Data

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ONLINE APPENDIX

This appendix provides detailed additional information about worker and job flows in Ethiopia.

A. Variation by firm size, sector and regions

While small establishments grow faster than large ones on average as shown in Table 3 of the main paper, Panel B of Table A1 shows that about 87% of them remain small during the sample period. Small establishments also tend to have shorter spells with an average NEGR of -6% as shown in Panel A of Table A1. Only a small fraction of initially small establishments moved up the size categories by sustaining atypically rapid employment growth (about 15% or more). These high performing small firms (at times referred to as “gazelles”) are the reason why small establishments, on average, seem to grow faster than larger firms as reported in Table 3. About three quarters of initially large establishments also remained in the same category and registered a 1.6% NEGR. The remaining 25% experienced sharp employment contraction and moved down the size categories dragging the average NEGR below zero for all initially large establishments as reported in Table 3. Firm size is thus largely persistent among the ubiquitous very small establishments and the relatively few large employers. Among medium size establishments, firm size seems less persistent. See Figure A1 for the distribution of NEGR across establishments.

Figure A2 shows that the manufacturing and services sectors accounts for 20% and 55% of formal private employment in Ethiopia, respectively¹, with very little change over the sample period. While manufacturing and services have statistically insignificant difference in employment growth, Table A2 shows significantly lower worker turnover and churning rates in manufacturing. The construction sector features above average NEGR reflecting the construction boom in urban areas and the massive public investment program in infrastructure in Ethiopia over the last two decades (Moller et al., 2017). Nonetheless, construction jobs feature the highest worker turnover and churning rates². It is worth noticing that a significant part of the sectoral difference in worker flows is likely associated with differences in average establishment size as shown in Table A3³.

Lastly, we find substantial geographic variation in employment growth but not in worker flows as reported in Table A4. Panel A of Table A5 also shows considerable geographic concentration of private sector establishments and employment in the capital city Addis Ababa.⁴

¹ Although manufacturing accounts for less than 5% of total employment in the Ethiopian economy, Figure 2 shows its critical important in the modern private sector. The construction and not-for-profit sectors each account for 11% of employment. Not-for-profit organizations include business and professional associations as well as other non-governmental organizations.

² This likely reflects the nature of employment contracts in this sector as they tend to be project specific and workers are loosely attached with a particular employer.

³ In fact, Table A2 in the appendix shows that 74% of service providers are very small establishments with fewer than 11 workers while only 43% of manufacturers operate at this scale. The average manufacturing establishment has 58 workers, which is nearly four times the average size of a service provider

⁴ About 44% of establishments and 61% the jobs they created are located in Addis Ababa although the capital city accounts for less than 5% of the Ethiopian population. The federal

B. Time-series features of job and worker flows

Figure A3 shows a declining trend in net employment growth during the sample period. This downturn intensified since March 2016 with NEGR dropping to -9.8% and -24% in September 2017 and March 2018, respectively, before bouncing back to -1.6% in September 2018. While labor market tightness would normally reflect a country's macroeconomic performance, this does not seem to be the case in Ethiopia at least during our sample period as the economy has been growing by 9% p.a. during 2012-2018. The slack labor market rather seems to reflect the elevated political uncertainty in the latter part of the sample period marked by two state-of-emergency declarations⁵. The political upheaval precipitated renewed demand for deeper economic and political reforms and paved the way for the appointment of a new Prime Minister in April 2018. The sharp recovery in NEGR in September 2018, the first data point after the appointment of the new PM, underscores the critical importance of political stability for labor market performance. It is also interesting to see how the POESSA data seem to capture these turning points rather adequately. The recovery in NEGR in September 2018 is largely due to a sharp decline in the separation rate rather than an improvement in hiring rate as shown in Figure A3. While the relative improvement in political conditions in the second and third quarters

city administrations of Addis Ababa and Dire Dawa, which are historical centers of commerce and manufacturing, have some of the lowest net employment growth rates while previously marginal regions enjoyed faster growth.

⁵ The government declared a state of emergency in October 2016 amidst rising political unrest that started in the last quarter of 2015. Mass protests triggered by disputes over land rights in parts of the Oromiya region bordering Addis Ababa spread quickly to the Amhara region. Although the first state of emergency was lifted in August 2017, a second one was issued in February 2018 due to a restart of mass protests.

of 2018 appear to have encouraged employers to reduce firing, business confidence does not seem to be strong enough to spur hiring.

To better understand the dynamics of the formal labor market, we further examine whether the decline in aggregate NEGR was largely due to changes in the fraction of growing, downsizing and stagnating firms or due to changes in the average rates of employment expansion and contraction. We explore this by splitting the sample into three periods: a period of relatively strong NEGR during 2012 and 2013 (11%), a period of weak but positive NEGR during 2014 and 2015 (2.1%), and a period of negative NEGR during 2016-2018 (-4.5%). Table A6 shows that NEGR declined over time not only because of adjustments in the extensive margin where the fraction of contracting firms increased and that of growing firms declined, but also due to adjustments in the intensive margin where NEGR among expanding firms attenuated and the rate of contraction among downsizing firms accentuated. However, adjustments in the extensive margin seem to be more pronounced than adjustments in the intensive margin as shown in Table A6. This suggests that while firm heterogeneity accounts for the simultaneous expansion and contraction of firms at any point in time, the Ethiopian labor market also exhibits common trends where both the fraction of growing firms and their average rate of growth declined during the sample period just as the fraction of downsizing firms and the rate at which they did so increased.

Another important consideration is whether aggregate values of job and worker flows are correlated with trends in NEGR. Figure A4 shows that job flows are relatively

stable over time as compared to worker flows. It is also evident that total worker turnover is nearly equally split between job flows and churning flows. While a closer look at Figure A4 shows some co-movement between churning and NEGR⁶, it is not strong enough to imply procyclical churning as reported in Lazear and Spletzer (2012) for the United States. Figure A5 shows that trends in NEGR are very similar across sectors except for sharp downturns in agriculture due to weather shocks. Churning seems to show more variation across sectors relative to NEGR although they exhibit similar trends.

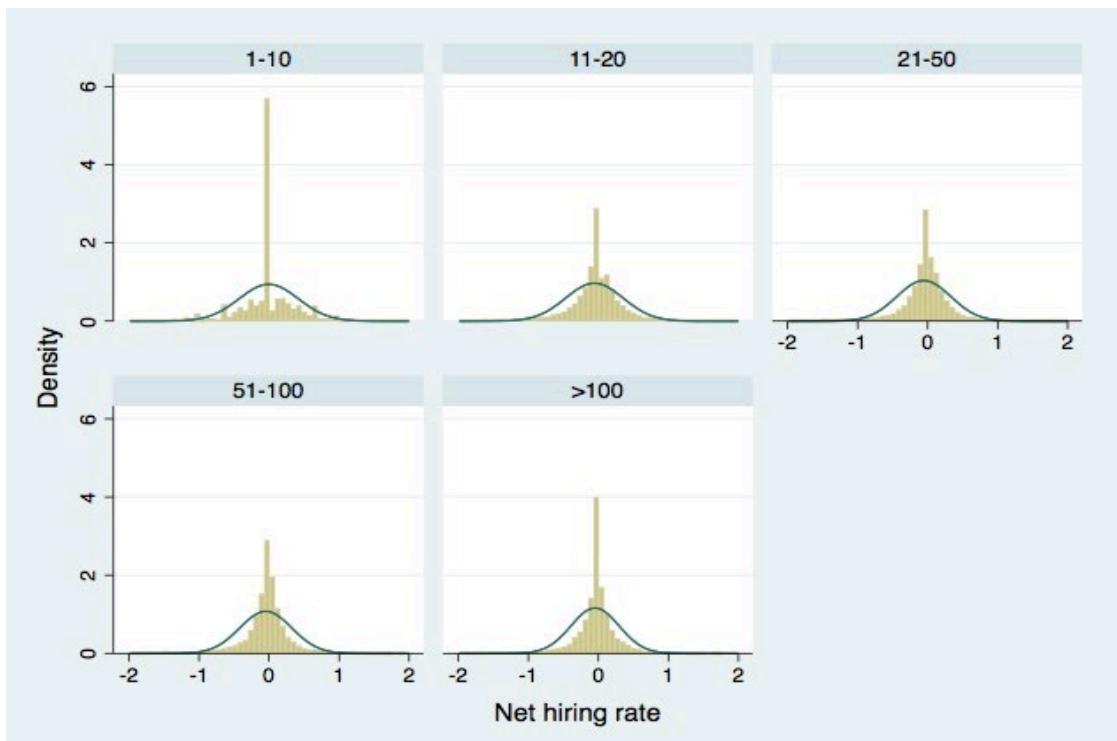


Figure 1A: Distribution of Net Employment Growth Rate by Establishment Size

⁶The correlation between aggregate NEGR and Churning is 0.05 and statistically insignificant.

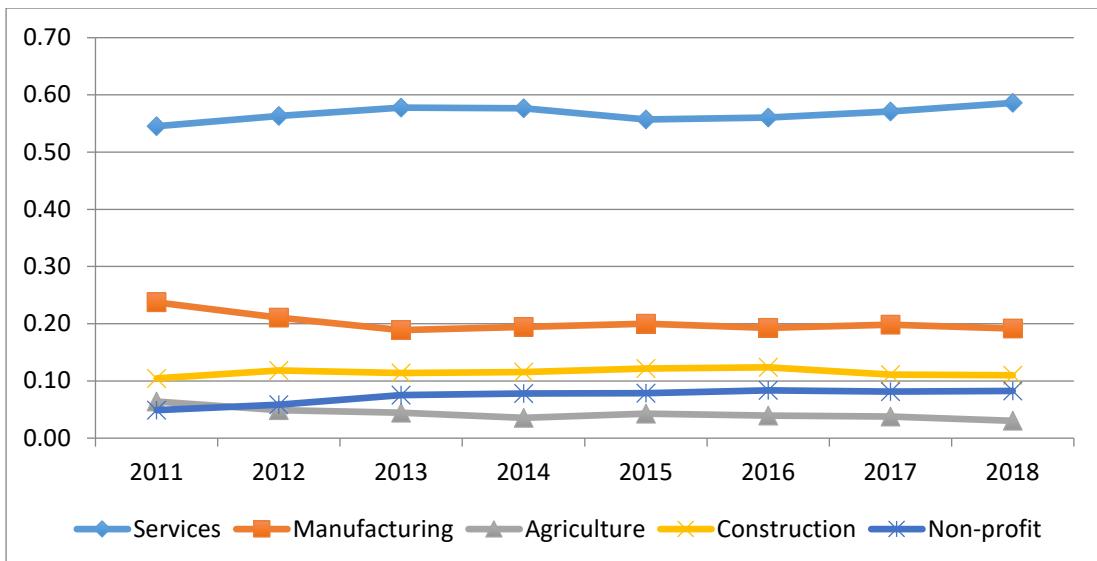


Figure A2: Sectoral distribution of formal private sector employment



Figure A3: Aggregate Rates of Hiring (HR), Separation (SR) and Net Employment Growth (NEGR).

Note: The horizontal axis shows year and month of observation such that 20123 stands for March 2012 while 20129 stands for September 2012.

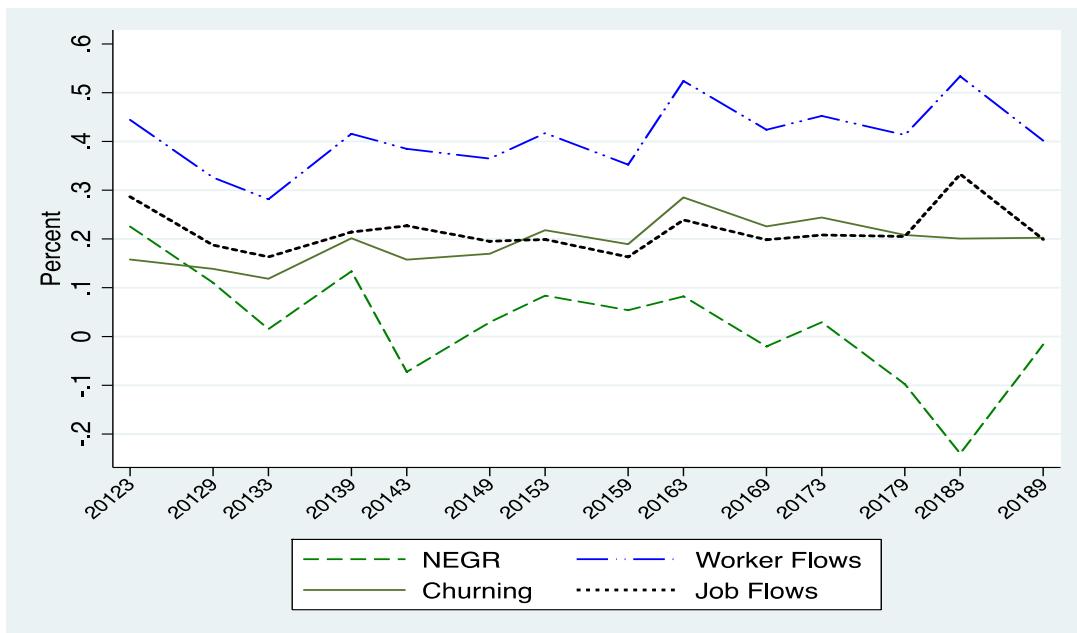


Figure A4: Trends in net employment growth, worker flows, job flows and churning

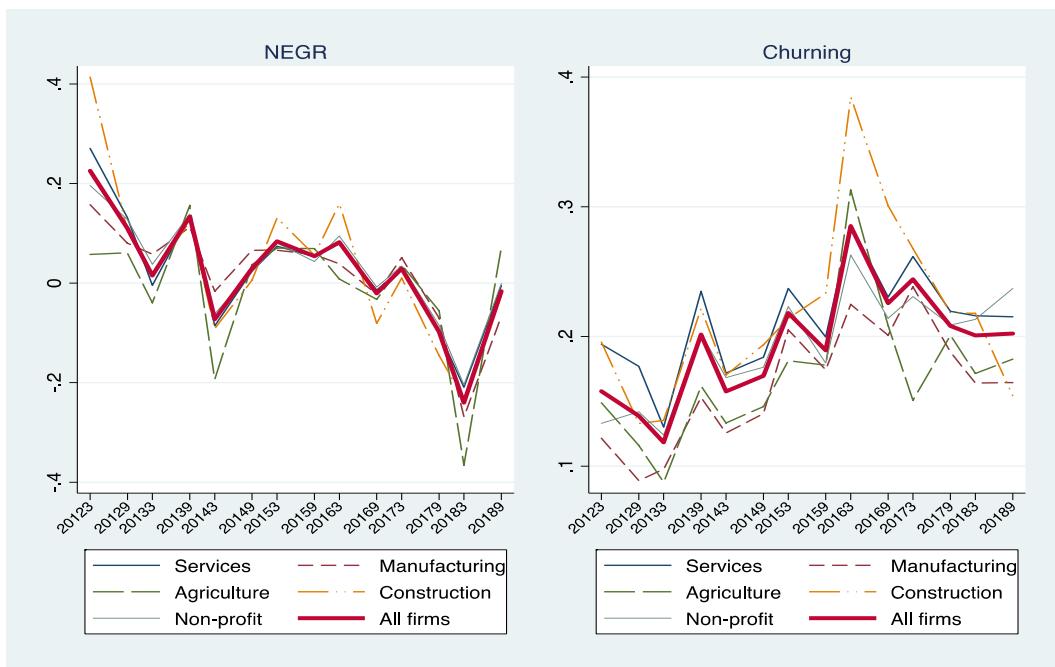


Figure A5: Sectoral trends in net employment growth and churning.

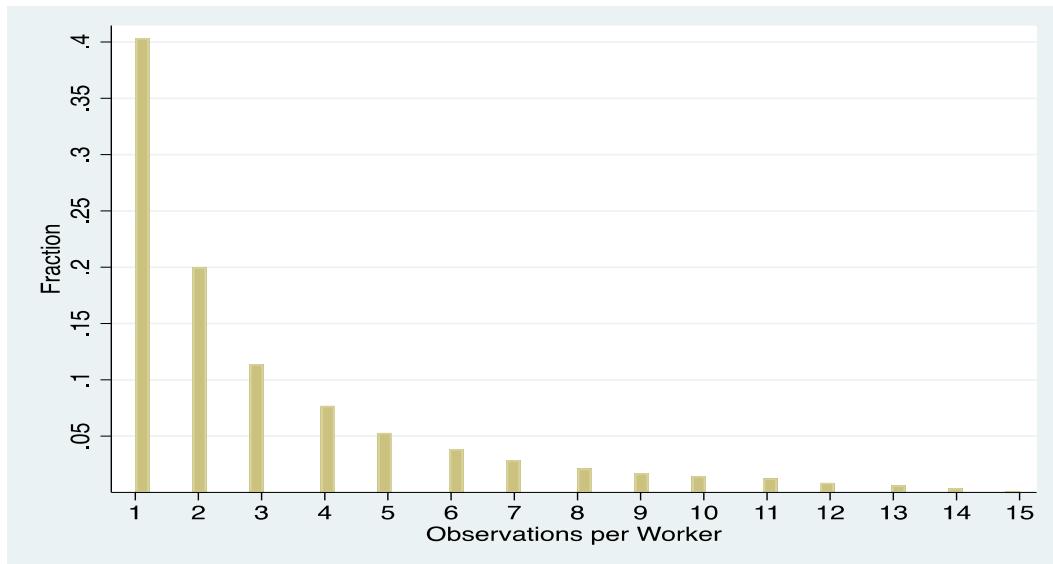


Figure A6: Distribution of number of observations per worker for the entire sample.
Note: This distribution applies to all workers in our sample regardless of the number of times the firm is observed in the data.

Table A1: Transition rate between establishment-size categories and mean NEGR

| Base Establishment Size | Contemporaneous Establishment Size | | | | | | Total |
|--|------------------------------------|---------------|------------------|--------------------|--------------|---------|-------|
| | Very Small (1-10) | Small (11-20) | Medium I (21-50) | Medium II (51-100) | Large (>100) | | |
| | A. Mean Net Employment Growth Rate | | | | | | |
| 1-10 | -0.0598 | 0.1313 | 0.1527 | 0.1695 | 0.1673 | 0.0486 | |
| 11-20 | -0.3414 | -0.0137 | 0.1144 | 0.1535 | 0.1766 | 0.0196 | |
| 21-50 | -0.6661 | -0.2039 | 0.0071 | 0.1047 | 0.1707 | 0.0147 | |
| 51-100 | -0.8595 | -0.5447 | -0.1658 | 0.0018 | 0.1165 | 0.0116 | |
| >100 | -0.5264 | -0.8878 | -0.5010 | -0.1813 | 0.0156 | -0.0101 | |
| Total | -0.1513 | -0.0291 | 0.0097 | 0.0216 | 0.0551 | 0.0116 | |
| B. Transition Probability and Duration | | | | | | N | |
| 1-10 | 86.5 (6.1) | 9.0 (8.9) | 3.3 (9.9) | 0.8 (10.6) | 0.5 (11.6) | 121962 | |
| 11-20 | 34.5 (8.4) | 41.3 (7.9) | 19.4 (9.5) | 3.2 (10.4) | 1.6 (11.9) | 25920 | |
| 21-50 | 11.4 (8.5) | 20.9 (9.4) | 52.2 (9.0) | 11.4 (9.8) | 4.2 (11.8) | 20437 | |
| 51-100 | 4.2 (9.6) | 5.4 (9.3) | 27.8 (10.3) | 42.3 (10.3) | 20.2 (11.7) | 7561 | |
| >100 | 2.1 (10.7) | 1.5 (9.7) | 5.6 (10.6) | 17.3 (11.8) | 73.6 (11.9) | 6796 | |
| Total | 64.1 (6.3) | 14.5 (8.5) | 12.1 (9.4) | 4.6 10.4) | 4.6 (11.9) | 182676 | |

Note: Panel A shows weighted sample means of net-hiring rate. The upper number in italics in Panel B are transition probabilities that add up to 100% along a row. The last column in Panel B reports total number of observations in each row. The numbers in parenthesis are the number of times establishments in a particular cell are observed on average.

Table A2: Job and Worker Flows Across Sectors

| | MN | SR | CN | AG | NP | ALL |
|--------------|--------|--------|--------|---------|--------|---------|
| HR | 0.1800 | 0.2094 | 0.2590 | 0.1729 | 0.2039 | 0.2031 |
| SR | 0.1599 | 0.1830 | 0.2214 | 0.1771 | 0.1731 | 0.1795 |
| NEGR | 0.0201 | 0.0263 | 0.0376 | -0.0043 | 0.0308 | 0.0236 |
| JCR | 0.1031 | 0.1221 | 0.1387 | 0.0985 | 0.1185 | 0.1122 |
| JDR | 0.0830 | 0.0991 | 0.1091 | 0.1017 | 0.0905 | 0.0886 |
| JFR | 0.1861 | 0.2213 | 0.2478 | 0.2002 | 0.2090 | 0.2008 |
| WFR | 0.3399 | 0.3924 | 0.4804 | 0.3500 | 0.3770 | 0.3826 |
| EWFR | 0.1538 | 0.1711 | 0.2326 | 0.1498 | 0.1681 | 0.1818 |
| Observations | 13601 | 90893 | 12766 | 3522 | 51938 | 182676* |

Note: see notes under Table 1. The column heads represent firms in Manufacturing (MN), Services (SR), Construction (CN), Agriculture (AG) and Non-profit (NP) sectors. * About 5.4% of observations have no sector indicators.

Table A3: Distribution of establishment size by sector (%) and average establishment size

| Establishment Size | MN | SR | CN | AG | NP | All |
|--------------------|-------|--------|-------|-------|-------|--------|
| 1-10 | 43.26 | 73.87 | 62.76 | 63.85 | 63.68 | 67.52 |
| 11-20 | 15.27 | 12.19 | 12.75 | 11.18 | 15.91 | 13.54 |
| 21-50 | 17.37 | 8.74 | 11.94 | 8.85 | 13.06 | 10.91 |
| 51-100 | 9.97 | 2.84 | 5.63 | 4.43 | 4.42 | 4.09 |
| >100 | 14.13 | 2.36 | 6.92 | 11.68 | 2.93 | 3.94 |
| Mean Firm Size | 57.80 | 15.20 | 33.0 | 44.50 | 20.2 | 21.8 |
| Observations | 16413 | 116912 | 16772 | 4382 | 64643 | 219122 |

Note: The numbers add to 100% within each sector across establishment size categories.
 N is the number of observations.

Table A4: Net Employment Growth Rate and Churning Across Regional States

| | Net Employment Growth Rate | | | | Churning Rate | | | |
|-----------------------|----------------------------|---------------|---------------|--------|---------------|---------------|---------------|--------|
| | 2012- 2013 | 2014- 2015 | 2016- 2018 | Total | 2012- 2013 | 2014- 2015 | 2016- 2018 | Total |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Addis Ababa | 0.1175 | 0.0278 | -0.0712 | 0.0040 | 0.1362 | 0.1651 | 0.2058 | 0.1768 |
| Dire Dawa | 0.0626 | -0.0027 | -0.0183 | 0.0082 | 0.1626 | 0.2155 | 0.2157 | 0.2007 |
| Oromiya | 0.0711 | 0.0013 | -0.0264 | 0.0090 | 0.1961 | 0.2098 | 0.2517 | 0.2239 |
| Harar | 0.0456 | 0.0425 | -0.0368 | 0.0112 | 0.0649 | 0.1730 | 0.1666 | 0.1310 |
| Benishangul- Gumuz | 0.0802 | 0.0475 | -0.0242 | 0.0132 | 0.1699 | 0.1835 | 0.2604 | 0.2240 |
| Afar | 0.1519 | -0.1099 | 0.0463 | 0.0202 | 0.2965 | 0.3076 | 0.3103 | 0.3072 |
| Amhara | 0.0939 | 0.0101 | 0.0080 | 0.0240 | 0.2052 | 0.2372 | 0.3287 | 0.2831 |
| SNNPR | 0.0954 | 0.0193 | -0.0122 | 0.0249 | 0.1658 | 0.1949 | 0.2454 | 0.2104 |
| Gambela | 0.0791 | 0.0818 | 0.0008 | 0.0413 | 0.2593 | 0.2596 | 0.3031 | 0.2810 |
| Tigray | 0.1869 | 0.0009 | 0.0327 | 0.0565 | 0.1808 | 0.2186 | 0.2152 | 0.2089 |
| Somali | 0.2110 | -0.0641 | 0.0688 | 0.0653 | 0.1660 | 0.1960 | 0.1821 | 0.1822 |
| Total | 0.1094 | 0.0206 | -0.0447 | 0.0236 | 0.1540 | 0.1827 | 0.2296 | 0.1818 |

Table A5: Cross-region distribution of establishments and employment by sector (per cent)

| A. Distribution of establishments | | | | | | |
|-----------------------------------|---------------|----------|-------------|-----------|------------|--------|
| Region | Manufacturing | Services | Agriculture | Construct | Non-profit | Total |
| Addis Ababa | 0.5421 | 0.4442 | 0.1148 | 0.5835 | 0.3786 | 0.4362 |
| Amhara | 0.0731 | 0.2277 | 0.1979 | 0.1824 | 0.1887 | 0.2005 |
| Oromiya | 0.1197 | 0.0960 | 0.2161 | 0.0814 | 0.1885 | 0.1263 |
| SNNPR | 0.0699 | 0.1367 | 0.1435 | 0.0712 | 0.1028 | 0.1168 |
| Tigray | 0.1306 | 0.0534 | 0.2403 | 0.0498 | 0.0623 | 0.0653 |
| Dire Dawa | 0.0423 | 0.0202 | 0.0062 | 0.0086 | 0.0227 | 0.0214 |
| Benishangul-Gumuz | 0.0031 | 0.0096 | 0.0707 | 0.0117 | 0.0291 | 0.0163 |
| Somali | 0.0052 | 0.0039 | 0.0009 | 0.0037 | 0.0102 | 0.0058 |
| Harar | 0.0101 | 0.0031 | 0.0000 | 0.0031 | 0.0097 | 0.0055 |
| Afar | 0.0038 | 0.0039 | 0.0078 | 0.0044 | 0.0044 | 0.0041 |
| Gambella | 0.0000 | 0.0015 | 0.0018 | 0.0003 | 0.0030 | 0.0018 |
| B. Distribution of employment | | | | | | |
| Addis Ababa | 0.6435 | 0.6521 | 0.1461 | 0.6184 | 0.5926 | 0.6096 |
| Amhara | 0.0562 | 0.1206 | 0.1412 | 0.1567 | 0.1013 | 0.1076 |
| Oromiya | 0.1180 | 0.0759 | 0.3695 | 0.0479 | 0.1258 | 0.1067 |
| SNNPR | 0.0704 | 0.0801 | 0.2492 | 0.1100 | 0.0767 | 0.0876 |
| Tigray | 0.0685 | 0.0344 | 0.0725 | 0.0409 | 0.0548 | 0.0491 |
| Dire Dawa | 0.0334 | 0.0242 | 0.0032 | 0.0035 | 0.0192 | 0.0214 |
| Benishangul-Gumuz | 0.0027 | 0.0046 | 0.0092 | 0.0113 | 0.0084 | 0.0062 |
| Somali | 0.0004 | 0.0019 | 0.0002 | 0.0044 | 0.0093 | 0.0039 |
| Harar | 0.0050 | 0.0020 | 0.0000 | 0.0020 | 0.0064 | 0.0037 |
| Afar | 0.0018 | 0.0030 | 0.0089 | 0.0047 | 0.0023 | 0.0030 |
| Gambella | 0.0000 | 0.0012 | 0.0002 | 0.0001 | 0.0034 | 0.0014 |

Note: Number add up to 100% within each column. The numbers refer to averages over the sample period, i.e. September 2011 to September 2018. Regional states are ranked by their share in the total number of firms in Panel A and by share in total employment in Panel B.

Table A6: Distribution of Net Employment Growth by Establishment Size and Status of Labor Market Conditions

| | Fraction of Establishments (%) | | | | Mean NEGR (%) | | |
|-------------------------------|--------------------------------|-------------|-------|---------|---------------|----------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | Growing | Contracting | Zero | N | Positive | Negative | Total |
| A. Very Small (<20) | | | | | | | |
| 2012-13 | 62.45 | 10.53 | 27.02 | 46,672 | 53.26 | -34.09 | 18.66 |
| 2014-15 | 42.52 | 22.21 | 35.27 | 55,266 | 38.75 | -36.16 | 5.18 |
| 2016-18 | 40.47 | 27.26 | 32.27 | 61,158 | 30.22 | -34.32 | -0.24 |
| Total | 47.45 | 20.76 | 31.79 | 163,096 | 37.03 | -34.80 | 4.70 |
| B. Small (21-50) | | | | | | | |
| 2012-13 | 64.62 | 22.63 | 12.75 | 9,163 | 39.50 | -23.97 | 13.18 |
| 2014-15 | 41.64 | 42.22 | 16.13 | 9,836 | 29.46 | -29.12 | 1.45 |
| 2016-18 | 43.37 | 44.14 | 12.49 | 12,140 | 26.26 | -31.01 | -2.57 |
| Total | 49.08 | 37.21 | 13.72 | 31,139 | 30.22 | -29.42 | 1.87 |
| C. Medium I (51-100) | | | | | | | |
| 2012-13 | 66.31 | 25.95 | 7.74 | 6,948 | 30.80 | -18.76 | 11.33 |
| 2014-15 | 43.32 | 45.23 | 11.44 | 7,176 | 22.14 | -23.23 | 0.63 |
| 2016-18 | 42.36 | 49.10 | 8.53 | 9,877 | 23.74 | -27.32 | -2.57 |
| Total | 49.58 | 41.24 | 9.17 | 24,001 | 25.12 | -24.74 | 1.42 |
| D. Medium II (>100) | | | | | | | |
| 2012-13 | 66.18 | 26.81 | 7.01 | 2,510 | 32.56 | -16.82 | 12.73 |
| 2014-15 | 45.46 | 44.82 | 9.72 | 2,499 | 20.87 | -21.37 | 2.17 |
| 2016-18 | 38.63 | 55.34 | 6.04 | 3,645 | 22.88 | -26.27 | -5.38 |
| Total | 48.59 | 44.03 | 7.38 | 8,654 | 25.07 | -23.45 | 1.15 |
| E. Large | | | | | | | |
| 2012-13 | 63.00 | 20.58 | 16.42 | 2,284 | 21.85 | -15.40 | 7.49 |
| 2014-15 | 43.24 | 42.50 | 14.26 | 2,174 | 15.96 | -17.10 | 1.23 |
| 2016-18 | 31.14 | 61.08 | 7.78 | 3,173 | 18.49 | -22.57 | -8.36 |
| Total | 44.12 | 43.66 | 12.21 | 7,631 | 18.85 | -20.23 | -1.02 |

Table A7: Worker and Job Flows and the Share of Churning

| | HR | SR | WFR | JFR | EWFR/WFR |
|--------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | 1 | 2 | 3 | 4 | 5 |
| Firm Size | -0.4263 (0.0100) | 0.1540 (0.0076) | -0.2723 (0.0128) | -0.3745 (0.0115) | 0.2727 (0.0103) |
| [Firm Size] ² | 0.0266 (0.0016) | -0.0032 (0.0014) | 0.0234 (0.0021) | 0.0344 (0.0020) | -0.0245 (0.0017) |
| Wage | 0.0010 (0.0046) | -0.0550 (0.0045) | -0.0541 (0.0063) | -0.0170 (0.0050) | -0.0302 (0.0060) |
| Benefits | -0.6421 (0.0515) | -0.5024 (0.0398) | -1.1445 (0.0662) | -0.3695 (0.0539) | -0.4004 (0.0708) |
| NEGR | -0.1506 (0.0037) | 0.0720 (0.0032) | -0.0786 (0.0046) | -0.1079 (0.0038) | 0.0714 (0.0043) |
| Intercept | -0.4120 (0.1446) | -1.2243 (0.1154) | -1.6363 (0.1884) | 0.1207 (0.1521) | -0.9576 (0.1977) |
| <i>R</i> ² | 0.26 | 0.15 | 0.09 | 0.13 | 0.04 |
| N | 82,059 | 82,059 | 82,059 | 82,059 | 71,870 |

Note: Firm Size and Benefits are in logarithms. Wage measures the deviation of establishment-level wage from the sector mean. NEGR is net employment growth. The column heads represent Hiring Rate (HR), Separation Rate (SR), Worker Flow Rate (FWR), Job Flow Rate (JFR) and the share of churning in turnover (EWFR/WFR).

Table A8: Distribution of observations per worker for firms observed throughout the sample period

| Observations per worker | Percent |
|-------------------------|---------|
| 1 | 9.95 |
| 2-3 | 14.36 |
| 4-5 | 15.57 |
| 6-7 | 15.25 |
| 8-9 | 13.39 |
| 10-11 | 14.77 |
| 12-13 | 12.80 |
| 14-15 | 3.91 |

Note: This table is based on firms that registered with POESSA in the first two years (2011 and 2012) and remained in the sample until 2018. Since this is a bi-annual data, the firms and workers in this table are observed for a maximum of 14 or 15 times

Table A9: Average firm size during the sample period (in logarithms)

| Year/Month | Median | Mean | Std. dev. |
|------------|--------|------|-----------|
| 2011-9 | 2.56 | 2.77 | 1.15 |
| 2012-3 | 2.40 | 2.67 | 1.12 |
| 2012-9 | 2.40 | 2.61 | 1.08 |
| 2013-3 | 2.30 | 2.53 | 1.04 |
| 2013-9 | 2.40 | 2.60 | 1.05 |
| 2014-3 | 2.20 | 2.48 | 1.01 |
| 2014-9 | 2.20 | 2.51 | 1.03 |
| 2015-3 | 2.30 | 2.59 | 1.07 |
| 2015-9 | 2.30 | 2.61 | 1.08 |
| 2016-3 | 2.40 | 2.64 | 1.09 |
| 2016-9 | 2.40 | 2.66 | 1.06 |
| 2017-3 | 2.56 | 2.75 | 1.10 |
| 2017-9 | 2.48 | 2.74 | 1.11 |
| 2018-3 | 2.56 | 2.75 | 1.09 |
| 2018-9 | 3.04 | 3.19 | 1.15 |
| Total | 2.40 | 2.65 | 1.08 |

Note: Numbers 9 and 3 refer to September and March of each year.