Policy Research Working Paper 10756

# The Role of Firm Dynamics in Aggregate Productivity and Formal Job Flows in Zambia

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WORLD BANK GROUP
Finance, Competitiveness and Innovation Global Practice
April 2024

Policy Research Working Paper 10756


## Abstract

Zambia's private sector must deliver quality jobs at scale to keep up with its expanding working age population, contribute to economic transformation, and reduce poverty. This entails both the creation of high-quality jobs and productivity improvement among existing jobs and firms. This paper analyzes the dynamics of formal firms to identify the drivers and barriers to productivity, formal employment, and formal wage growth in Zambia. Leveraging firm and worker administrative tax data from Zambia, the paper decomposes labor productivity and wage growth among formal firms and workers in Zambia into within-firm, between-firm, inter-sectoral, and dynamic components. The findings show that the aggregate labor productivity of formal firms declined over 2014–21, driven by secular within-firm declines in the non-mining industry and service sectors. By contrast, labor productivity grew in agriculture and remained flat in mining over the same period. Real wage trends for formal workers have mostly mirrored labor productivity dynamics, declining 40-50 percent across non-agriculture sectors but growing slightly in agriculture, largely driven by within-firm shifts rather than between-firm or between-sector dynamics. The declines in labor productivity and wages reflect business environment challenges related to access to finance and electricity, as well as burdensome formal compliance requirements and competition with the informal sector. Within-firm labor productivity challenges also reflect low skills and capacity—including low technology adoption—among both firms and workers.


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# The Role of Firm Dynamics in Aggregate Productivity and Formal Job Flows in Zambia

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**Keywords**: Productivity, Formal Jobs, Formal Wages, Structural Transformation

**JEL Codes**: D24, E24, J24, J31, L16

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[1] The team would also like to thank the following peer reviewers and colleagues for their contributions: Dino Merotto, Ekaterina Vostroknutova, Hanane Ahmed, Nicolo Dalvit, Fausto Patiño Pena, Sophia Muradyan, Jorge Tudela Pye, Albert Pijuan Sala, Joseph Simumba, Philip Schuler, Isaku Endo, Ahmed Rostom, Shaun Mann, and Mohammad Farid Al Azim Bin Noruzi, Soujanya Chodavarapu, and Vanina Daphne Forget.

# 1. Introduction

Zambia's private sector must deliver quality jobs at scale to keep up with the expanding working age population, contribute to economic transformation, and reduce poverty. Based on population growth projections, Zambia needs to create over 10 million new jobs by 2050 to keep its labor force participation and employment rates from declining. The country's working age population is projected to more than double between 2022 and 2050 (Merotto 2017). This growth will provide a demographic dividend if Zambia can drive productivity growth and economic transformation. However, if Zambia's private sector fails to generate enough good jobs to absorb this expansion, economic growth will fail to permeate to the rest of the economy as new working-age Zambians will be unable to access productive opportunities. This will limit its impact on poverty reduction and increase the risk of upheaval.

As well as creating new jobs, Zambia's private sector needs to make existing jobs more productive. Low productivity is limiting Zambia's potential to diversify its sources of growth and to create quality jobs and firms. While shifts in labor to higher-productivity sectors and within-sector productivity improvements can contribute to labor productivity growth and higher wages, Zambia's private sector has had limited success in both areas. Lower-productivity sectors such as agriculture (58.7 percent of employment) and wholesale and retail trade (14.1 percent) still account for most employment. Existing high-productivity sectors tend to generate few jobs. These include financial services (0.5 percent of jobs) and mining, which accounts for only 1.1 percent of jobs despite its role as Zambia's primary export driver. Meanwhile, lower-productivity informal employment accounts for three-quarters of jobs, and within-sector productivity has generally been flat (Zambia MLSS 2022, World Bank 2024).

It is thus critical to identify the drivers of and barriers to productivity, formal employment, and formal wage growth in Zambia. Leveraging firm and worker administrative tax data from Zambia, this paper decomposes labor productivity and wage growth among formal firms and workers in Zambia into within-firm, between-firm, inter-sectoral, and dynamic components. We find that aggregate labor productivity of formal firms declined over the 2014-2021 period, driven by secular within-firm declines in the non-mining industry and service sectors. By contrast, labor productivity grew in agriculture and remained flat in mining over the same period. Real wage trends for formal workers have mostly mirrored labor productivity dynamics, declining 40-50 percent across non-agriculture sectors but growing slightly in agriculture, largely driven by within-firm shifts rather than between-firm or between-sector dynamics. The declines in labor productivity and wages reflect business environment challenges related to access to finance and electricity, as well as burdensome formal compliance requirements and competition with the informal sector. Within-firm labor productivity challenges also reflect low skills and capacity—including low technology adoption—among both firms and workers.

The rest of this paper is structured as follows. Section 2 provides background about the related literature and the private sector in Zambia. Section 3 outlines the data sources we leverage in the paper. Section 4 first outlines the methodology used for productivity analyses and then discusses the results of these analyses. Section 5 outlines the methodology and results for jobs-related analyses. Section 6 discusses the productivity and wage findings in the context of salient business environment and firm-level constraints in Zambia. Section 7 concludes with the implications the paper's findings and areas for further research.

## 2. Related literature

Prior research has documented numerous challenges with respect to aggregate productivity and the private sector in Zambia. World Bank (2019b) and the first chapter of World Bank (2024)[2] detail Zambia's recent economic performance. They document how Zambia's real GDP growth of 7.7 percent per year between 2001 and 2010 was mostly driven by mining. However, growth slowed significantly in the 2010s, with GDP growth falling despite increased public investment. On an economy-wide basis, labor productivity growth averaged 3.7 per year in the 2000s but reversed in the 2010s, remaining negative for most years over the 2011-2020 period. Since 2000, within-sector productivity gains were negligible in most sectors, with any productivity gains that did occur mostly coming from inter-sectoral reallocation of resources from less to more productive sectors (World Bank 2024). At the firm level, Hoy, et al. (2022) leverage firm-level tax data to analyze the impact of the COVID-19 pandemic on formal firms in Zambia, documenting large declines in sales and employment in formal firms at the outset of the pandemic, followed by a rapid recovery in sales but less robust recovery in employment.

Merotto (2017) analyzes trends in labor supply in Zambia through Labour Force Survey data, finding evidence of growing underemployment in Zambia. He shows how, despite the share of working-age workers employed in waged jobs increasing from 17 to 29 percent between 2008 and 2014, the bulk of new job creation continues to be informal, with wide wage gaps between the formal and informal sectors, between rural and urban workers, between men and women, and between unskilled and skilled workers. He further leverages data from Zambia's 2012 Economic Census to analyze labor demand, finding low rates of micro firm survival and low productivity in manufacturing sectors.

This paper seeks to fill gaps in the literature with respect to recent firm-level productivity dynamics in Zambia. Research on productivity in Zambia tends to focus on macroeconomic data (World Bank 2024, World Bank 2019b) or rely on Economic Census data, which were last collected in 2012 and do not constitute a panel (Merotto 2017). Although Hoy, et al. (2022) do analyze more recent tax data—indeed, the same Corporate Income Tax database that this paper leverages—their research focus is more narrowly on firm performance during COVID-19. Enriching the understanding of such firm-level productivity dynamics would allow for a deeper understanding of the drivers and constraints of productivity, job creation, and wages, differentiating between the contributions of economy-wide issues, structural change between sectors, within-sector market dynamics, and within-firm technical efficiency (Cusolito and Maloney 2018). This could in turn yield more specific policy insights and uncover priorities for further research.

In terms of its methodological approach and key topics of interest, this paper is related to other studies that decompose productivity and job trends within countries utilizing firm-level data. Olley and Pakes (1996), Melitz and Polanec (2015), and Patiño Peña and Ferro (Forthcoming), among others, develop methods for decomposing productivity growth into between-, within-firm, entry, exit, and inter-sectoral components—and applied these methods to the United States and Slovenia, respectively.[3] Similar productivity analyses and decompositions have since been conducted for Côte d'Ivoire (World Bank 2021a), Croatia (World Bank 2022a), Ecuador (Patiño Peña and Ferro Forthcoming), Kosovo (World Bank 2021b), and Türkiye (World Bank 2019a), among other countries. Findings vary widely across countries,

[2] This paper is a background technical note on which the third chapter of World Bank (2024) is based, whereas the first two chapters were authored in parallel with this paper.

[3] For a more detailed overview of the productivity estimation literature, refer to Cusolito and Maloney (2018).

reflecting their different economic structures, stages of development, and business environments. For example, in Côte d'Ivoire, Croatia, Ecuador, and Türkiye, studies find rising misallocation of resources—that is, less productive firms not being outcompeted by more productive ones—to be the main drag on productivity growth (World Bank 2021a, World Bank 2022a, Patiño Peña and Ferro Forthcoming, World Bank 2019a). By contrast, in Kosovo, the data suggest that falling productivity of incumbent firms is the main driver of overall productivity declines (World Bank 2021b).

## 3. Data

The empirical analyses in this paper leverage two databases from the Zambia Revenue Authority. One draws information from Corporate Income Tax (CIT) returns, while the other draws information from Pay As You Earn (PAYE) Tax returns. The CIT database covers over 5,000 firms that paid corporate income tax in Zambia for the 2014-2021 period. In Zambia, firms that have annual turnover (sales) exceeding ZMK 800,000 or engage in specified business activities are liable for CIT.[4] The standard income tax rate is 30 percent. However, certain industries have special rates that apply to them. For firms with annual profits below K250,000, the tax rate is 30 percent. For industries with annual profits exceeding K250,000, the rate is 40 percent. For those in farming and agro-processing, the rate is 10 percent, while certain manufacturing industries have a rate of 15 percent. If a firm's turnover is below the CIT filing threshold, the firm is liable for the Turnover Tax at 4 percent monthly across all sectors.[5] With variables drawn from firms' returns, the CIT database contains panel data on firms' registration location, sales, cost of sales, and wage bills. It is thus the primary source of firm-level variables for output, capital, labor, and inputs used for productivity estimation (see below discussion on specific variables used for estimation). Available and comparable CIT data cover the 2014-2021 period.

The PAYE database covers over 800,000 workers that paid into PAYE tax in Zambia over the 2014-2022 period. In Zambia, every firm that offers employment is required to operate PAYE, which is a method of collecting income tax from their employees' earnings, although in practice compliance varies across firms and across workers within firms and is limited overall. The employer is obligated by law to deduct income tax from its employees' taxable salary or wages—regardless of whether they are full-time workers or casual employees—on a weekly, fortnightly, or monthly basis. The tax is deducted from all types of payments made to an employee, including salaries and wages, overtime payments, bonuses, profit sharing, fees, leave pay, commissions, allowances, cash benefits, and any benefit, advantage, or allowance (excluding non-money fringe benefits) and payments on taking up or leaving employment.[6] PAYE income tax calculation is based on a progressive slab system that splits the total taxable income of the employee into brackets, with each tax bracket having a corresponding tax rate. Drawing information from fields in PAYE returns, the PAYE database provides information on formal workers' monthly gross pay and sector of operations. Thus, the PAYE database is the main source for jobs-related analyses in this paper. Available and comparable PAYE data cover the 2014-2022 period.

[4] Mining and consultancy firms are required to register for Corporate Income Tax regardless of their turnover.
[5] Turnover Tax filings are not part of the CIT database and not accounted for in this paper's analyses because Turnover Tax filings do not contain the necessary variables on labor and costs necessary for productivity estimation in line with this paper's methodology.
[6] Employee emoluments that are not subject to PAYE include Labour day Awards, Ex-gratia payments, Medical expenses and Funeral expenses.

The principal caveat of the data sources used in this paper is that the universe of firms and workers corresponds to only formal economic activity and specifically the subset of formal firms and workers that pay into CIT and PAYE, respectively. Thus, informal firms and workers are necessarily excluded, as are formal firms and workers not meeting or complying with the filing thresholds for CIT. Given statutory thresholds for tax filing and firm- and worker-specific drivers of tax compliance, firms and workers in the CIT and PAYE databases are likely to be quite different from excluded firms and workers. However, the firms and workers in the datasets constitute an economically significant portion of the Zambian economy. For 2021, the CIT dataset covers over 5,000 firms, which collectively account for ZMK 329 billion in sales, ZMK 118 billion in value added (equivalent to 27 percent of GDP), and 527,000 estimated workers. For the same year, the PAYE dataset covers over 800,000 unique workers, filing over 6.3 million monthly returns. Beyond their collective size, formal firms, and workers—as proxied through these datasets—are especially critical to economic transformation as they are likely to constitute the most productive segment of the economy and most likely to export (Amin, Ohnsorge and Okou 2019).

# 4. Firm dynamics and productivity

## 4.1. Methodology for productivity analyses

Leveraging these data, productivity-related analyses in this paper focus on labor productivity (LP) rather than total factor productivity (TFP). LP and TFP are two ways of computing firms' efficiency in converting inputs (capital, labor, etc.) to produce goods or services (output). Conceptually, LP measures output per worker and therefore looks only at how labor is converted into output, while TFP incorporates adjustments in other production factors (e.g., capital stock and intermediate inputs) as well as technology, innovation, management practices, and other ways of augmenting firm output with the same input endowment (Syverson 2011). Although TFP presents a more complete view of productivity, this analysis relies on LP given the lack of reliable data measuring capital or investment, which is a key prerequisite for TFP estimation. As no data on firm-level prices or quantities are available for Zambia, this paper calculates LP in revenue terms rather than in terms of physical quantity. LP calculated in revenue terms reflects not only firm physical efficiency in production but also prices that reflect product quality and marketing in addition to input costs (Cusolito and Maloney 2018). This analysis is unfortunately unable to capture these price-related dimensions and thus cannot definitively conclude that phenomena such as productivity dispersion are the result of allocative efficiency (or lack thereof), quality, or markups. The specific analytical implications of this limitation are further discussed in the subsequent discussion of the results.

Labor productivity is defined as value added per worker for the purposes of this paper. Value added is defined as sales less non-labor cost of sales. The number of workers is estimated by dividing firms' total wages bills by average annual wages at the ISIC A*38 level (calculated from the PAYE database). Value added is deflated in line with sectoral deflators obtained from ZamStat, which are roughly in line with the ISIC A*38 level of aggregation.

The methodology for decomposing labor productivity growth is drawn from Olley and Pakes (1996), Melitz and Polanec (2015) and Patiño Peña and Ferro (Forthcoming). Labor productivity is estimated and decomposed at the ISIC 1-digit level given the low number of observations per sector at the ISIC 2-digit

and A*38 levels.[7] The methodology defines sector $j's$ aggregate productivity, $\Omega_{j,t}$, as the weighted average of firm-level productivities:

$$\Omega_{j,t} = \sum_{i=1}^{N_{j,t}} s_{ij,t}\omega_{ij,t}, \tag{1}$$

where $s_{ij,t}$ is the share of firm $i$'s labor in total sector labor, $\omega_{ij,t}$ is the labor productivity of firm $i$, and $N_{j,t}$ is the total number of firms in sector $j$ and in year $t$. As in Olley and Pakes, aggregate sector productivity, $\Omega_{j,t}$, can be decomposed into two terms:

$$\Omega_{j,t} = \bar{\omega}_{j,t} + \sum_{i=1}^{N_{j,t}} \left(\omega_{ij,t} - \bar{\omega}_{j,t}\right)\left(s_{ij,t} - \bar{s}_{j,t}\right). \tag{2}$$

The first term in Equation (2) captures the level of efficiency with which firms in sector $j$ transform factor inputs into output, i.e., the technical efficiency of sector $j$, measured as the unweighted mean of firm productivities within the sector, $\bar{\omega}_{j,t} = \frac{1}{N_{j,t}}\sum_{i=1}^{N_{j,t}} \omega_{ij,t}$. The second component of Equation (2) measures the extent to which more productive firms capture a larger share of the sector's economic activity, i.e., the allocative efficiency of sector $j$, expressed as the covariance between firms' productivity and the share of their labor in the overall labor of sector $j$, $\sum_{i=1}^{N_{j,t}}\left(\omega_{ij,t} - \bar{\omega}_{j,t}\right)\left(s_{ij,t} - \bar{s}_{j,t}\right)$. Higher values of this term indicate greater allocative efficiency within the sector. Furthermore, differencing Equation (2) between year $t$ and year $t-1$, helps identify whether changes in aggregate productivity in sector $j$ are driven by variations in technical or allocative efficiency. Last, aggregate productivity of formal firms in the Zambian economy is defined as the weighted average of sector-level productivities:

$$\Omega_t = \sum_j \lambda_{j,t}\Omega_{j,t}, \tag{3}$$

where $\lambda_{j,t}$ is the share of sector $j's$ labor in the total economy's labor.

Following the approach developed by Melitz and Polanec (2015) and Patiño Peña and Ferro (Forthcoming), aggregate productivity growth ($\Delta\Omega_t = \Omega_t - \Omega_{t-1}$) in Zambia is decomposed into five components: the within, between, entry, exit, and structural transformation components. The decomposition can be expressed as:

$$\Delta\Omega_t = \sum_j \lambda_{j,t}\Delta\bar{\omega}_{j,t}^{survivor} + \sum_j \lambda_{j,t}\Delta Cov_{j,t}^{survivor} + \sum_j \lambda_{j,t}Entry_{j,t} + \sum_j \lambda_{j,t}Exit_{j,t-1} + \sum_j \Delta\lambda_{j,t}\Omega_{j,t-1}. \tag{4}$$

The within component, $\sum_j \lambda_{j,t}\Delta\bar{\omega}_{j,t}^{survivor}$, captures aggregate productivity changes resulting from changes in the technical efficiency of survivor firms. The between component, $\sum_j \lambda_{j,t}\Delta Cov_{j,t}^{survivor}$, accounts for changes in aggregate productivity due to resource reallocation among surviving firms. The entry component, $\sum_j \lambda_{j,t}Entry_{j,t}$, reflects aggregate productivity changes driven by the entry of new firms in the market in period $t$. Last, the exit component, $\sum_j \lambda_{j,t}Exit_{j,t-1}$, corresponds to aggregate productivity changes resulting from the exit of firms between period $t-1$ and $t$. These first four components of

[7] Wholesale and retail trade of motor vehicles and motorcycles, wholesale trade, and retail trade are split into the ISIC 2-digit level given the high number of observations in these 2-digit sectors. All other sectors are at the ISIC 1-digit level.

Equation (4) capture changes in aggregate productivity driven by firm dynamics that occur within sectors, as they are weighted averages of sector-level measures. The last component of Equation (4) is the structural transformation component, $\sum_j \Delta\lambda_{j,t}\Omega_{j,t-1}$, and reflects changes in aggregate productivity driven by the reallocation of economic activity across sectors. The following paragraphs provide further detail on the derivation of this decomposition approach.

The decomposition outlined above requires firm panel data that allows the classification of firms into three groups at the sector level, for a pair of two consecutive years, $t-1$ and $t$. For this, the set of all firms in sector $j$ and in year $t$ is defined as $I_{j,t} = \{1, \ldots\ldots, N_{j,t}\}$. The first group of firms in sector $j$ corresponds to survivors, which are firms that operate in both years $t-1$ and $t$. The set of survivor firms is denoted as $C_{j,t} = I_{j,t} \cap I_{j,t-1}$. The second group of firms in sector $j$ is comprised of enterprises, which did not operate in year $t-1$, but operated in year $t$, the entrant firms. This set of firms is defined as $E_{j,t} = \{i \in I_{j,t} \text{ and } i \notin I_{j,t-1}\}$. Last, the third group of firms in sector $j$ are exiters, which operated in year $t-1$, but did not operate in year $t$. The set of exiter firms is given by $X_{j,t-1} = \{i \notin I_{j,t} \text{ and } i \in I_{j,t-1}\}$.

As in Melitz and Polanec (2015) and Patiño Peña and Ferro (Forthcoming), sector $j$'s aggregate productivity growth, $\Delta\Omega_{j,t} = \Omega_{j,t} - \Omega_{j,t-1}$, can be decomposed as:

$$\Delta\Omega_{j,t} = \Delta\bar{\omega}_{j,t}^{survivor} + \Delta Corr_{j,t}^{survivor} + Entry_{j,t} + Exit_{j,t-1}. \quad (5)$$

The first element of Equation (5) captures changes in the technical efficiency of survivor firms in sector $j$, measured as the difference in the simple average of survivor firms' productivity in the sector:

$$\Delta\bar{\omega}_{j,t}^{survivor} = \bar{\omega}_{j,t}^{survivor} - \bar{\omega}_{j,t-1}^{survivor}.$$

where $\bar{\omega}_{j,t}^{survivor} = \frac{1}{|C_{j,t}|}\sum_{i\in C_{j,t}} \omega_{ij,t}$ and $\bar{\omega}_{j,t-1}^{survivor} = \frac{1}{|C_{j,t}|}\sum_{i\in C_{j,t}} \omega_{ij,t-1}$. The second element of Equation (5) measures shifts of labor market shares, within sector $j$, between firms that operated in both periods by differencing the covariance between firms' productivity and the share of firms' labor share in sector $j$'s labor at times $t$ and $t-1$:

$$\Delta Cov_{j,t}^{survivor} = \sum_{i\in C_{j,t}} \left(\omega_{ij,t} - \bar{\omega}_{j,t}^{survivor}\right)\left(s_{ij,t} - \bar{s}_{j,t}^{survivor}\right) - \sum_{i\in C_{j,t}} \left(\omega_{ij,t-1} - \bar{\omega}_{j,t-1}^{survivor}\right)\left(s_{ij,t-1} - \bar{s}_{j,t-1}^{survivor}\right)$$

where $\bar{s}_{j,t}^{survivor} = \frac{1}{|C_{j,t}|}\sum_{i\in C_{j,t}} s_{ij,t}$ and $\bar{s}_{j,t-1}^{survivor} = \frac{1}{|C_{j,t}|}\sum_{i\in C_{j,t}} s_{ij,t-1}$. The third element of Equation (5) captures changes in sector aggregate productivity arising from the entrance of new firms. It is calculated as the labor shares of sector $j$'s entrants times the difference between the weighted sum of firm-level productivities of sector $j$'s entrants, $\Omega_{j,t}^{E} = \sum_{i\in E_{j,t}} s_{ij,t}\omega_{ij,t}$, and the weighted sum of firm-level productivities of sector $j$'s survivors, $\Omega_{j,t}^{C} = \sum_{i\in C_{j,t}} s_{ij,t}\omega_{ij,t}$, in period $t$:

$$Entry_{j,t} = \left(\sum_{i\in E_{j,t}} s_{ij,t}\right)\left(\Omega_{j,t}^{E} - \Omega_{j,t}^{C}\right).$$

The last element of Equation (5) quantifies the contribution of exiters to sector aggregate productivity growth and is measured as the market share of sector $j$'s exiter firms times the difference between the weighted sum of firm-level productivities of sector $j$'s survivors, $\Omega_{j,t-1}^{C} = \sum_{i\in C_{j,t}} s_{ij,t-1}\omega_{ij,t-1}$, and the weighted sum of firm-level productivities of sector $j$'s exiters, $\Omega_{j,t-1}^{X} = \sum_{i\in X_{j,t-1}} s_{ij,t-1}\omega_{ij,t-1}$, in period $t-1$:

$$Exit_{j,t-1} = \left( \sum_{i \in X_{j,t-1}} s_{ij,t-1} \right) \left( \Omega^{C}_{j,t-1} - \Omega^{X}_{j,t-1} \right).$$

This decomposition of sector aggregate productivity is then used to define the decomposition of economy-wide aggregate productivity. By differencing aggregate productivity $\Omega_t$ between periods $t$ and $t-1$ using Equation (4), change in aggregate productivity can be expressed as:

$$\Delta\Omega_t = \sum_j \lambda_{j,t}\Omega_{j,t} - \sum_j \lambda_{j,t-1}\Omega_{j,t-1} = \sum_j \left\{ \lambda_{j,t}\Delta\Omega_{j,t} + \Delta\lambda_{j,t}\Omega_{j,t-1} \right\}.$$

Replacing $\Delta\Omega_{j,t}$ with the expression of Equation (5) into the equation above, total economy aggregate productivity growth is characterized as in Equation (4):

$$\Delta\Omega_t = \sum_j \lambda_{j,t}\Delta\bar{\omega}^{survivor}_{j,t} + \sum_j \lambda_{j,t}\Delta Cov^{survivor}_{j,t} + \sum_j \lambda_{j,t} Entry_{j,t} + \sum_j \lambda_{j,t} Exit_{j,t-1} + \sum_j \Delta\lambda_{j,t}\Omega_{j,t-1}.$$

## 4.2. Descriptive overview of firms in the Zambia CIT Database

Table 1 provides summary statistics from the cleaned CIT data. Overall, the CIT database contains 37,651 observations over the 2014-2021 period, covering between 4,060 and 5,099 firms in any given year. On average, firm-year observations averaged ZMK 42.8 million in annual sales (non-deflated) and ZMK 14.3 million in value added (non-deflated), and an estimated 14.3 full-time equivalent (FTE) employees.

Table 1. Summary statistics for key variables

| Variable | n | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| Sales (ZMK million; nominal) | 37,651 | 42.8 | 391.0 | 0.0010 | 40200.0 |
| Sales (ZMK million; 2010 prices) | 37,651 | 22.2 | 152.0 | 0.0004 | 8530.0 |
| Value added (ZMK million; nominal) | 37,651 | 14.3 | 203.0 | 0.0002 | 26700.0 |
| Value added (ZMK million; 2010 prices) | 37,651 | 7.2 | 67.2 | 0.0001 | 4670.0 |
| Labor (estimated FTE) | 37,651 | 95.6 | 470.4 | 1.0 | 19643.9 |
| Labor productivity (2010 prices) | 37,651 | 74675.1 | 127179.0 | 3.4 | 9138730.0 |

Source: World Bank and ZRA staff calculations based on CIT database

CIT data suggest that formal firms play a significant and growing role in Zambia's economy, although they are still relatively small. In 2021, the CIT dataset covered over 5,000 firms, which together generated sales of ZMK 329 billion, value added of ZMK 118 billion (equivalent to 27 percent of GDP), and employed an estimated 527,000 workers. Most formal firms are micro or small firms with 10 or fewer employees. However, large firms (defined in Zambia as having over 100 employees) employ the majority of workers and contribute the most value added among formal firms. Formal firms located in Lusaka or Copperbelt Provinces also account for the majority of formal firms, value added, and labor. The allocation of labor across firms in the formal sector has generally remained stable over time. Over the 2014-2021 period, agriculture's share of formal firms' labor generally fluctuated around 20-23 percent, mining and quarrying's share around 8-10 per cent, the rest of the industry's share around 18-

20 percent, and non-industrial services' share 50-55 percent, with little discernible overall trend.[8] These findings are reflected in Figure 1-Figure 9.

Figure 1. Share of formal firms by province of registration

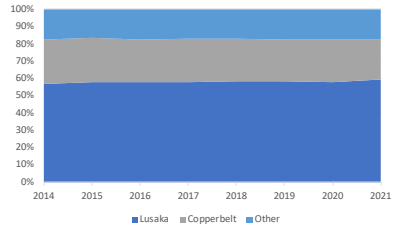



Figure 2. Share of real value added of formal firms by province of registration (constant 2010 prices)

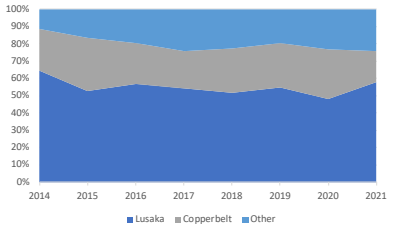



Figure 3. Share of labor of formal firms by province of registration

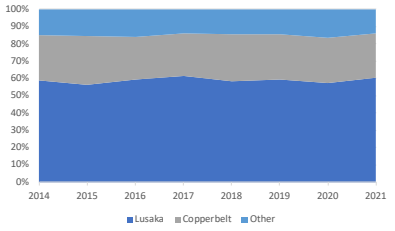



Figure 4. Share of formal firms by size

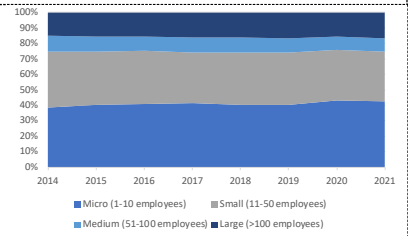



Figure 5. Share of real value added of formal firms by size (constant 2010 prices)

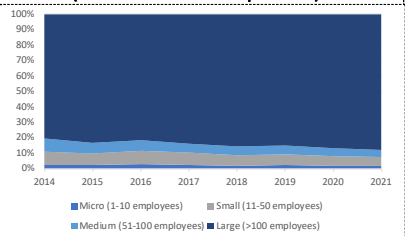



Figure 6. Share of labor of formal firms by size

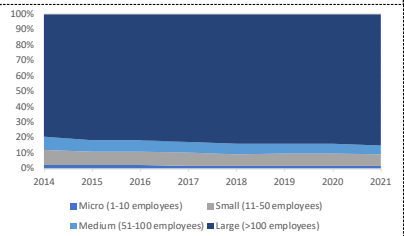



Figure 7. Share of formal firms by overall sector

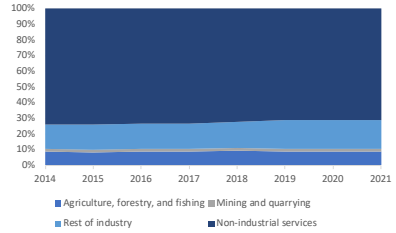



Figure 8. Share of real value added of formal firms by overall sector (constant 2010 prices)

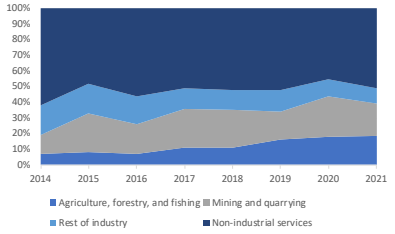
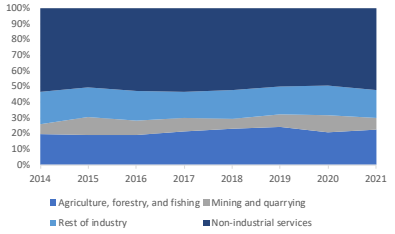



Figure 9. Share of labor of formal firms by overall sector

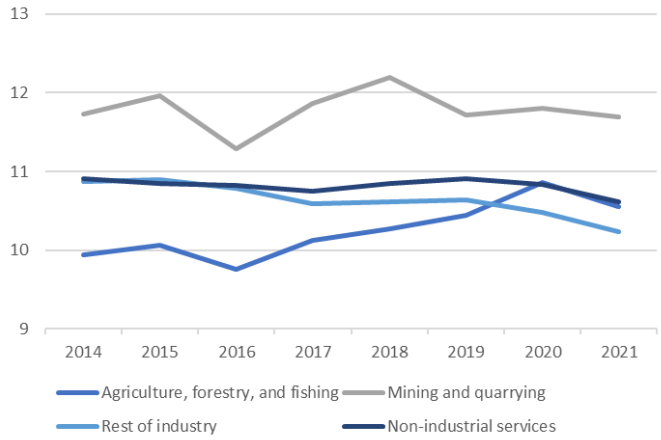



Source: World Bank and ZRA staff calculations based on CIT database

Across the same period, formal firms in mining and quarrying generally had the highest labor productivity, followed by formal firms in the rest of industry and services, then formal firms in agriculture. However, in more recent years, the labor productivity of formal firms in agriculture has exceeded that of formal firms in rest of industry, as will be discussed further (see Figure 10).

[8] At the ISIC 1-digit level, the largest constituent sectors within rest of industry are manufacturing (12 percent of formal firms' labor in 2021) and construction (5 percent). The largest constituent sectors within services are retail trade (20 percent), wholesale trade (7 percent), administrative and support service activities (5 percent), financial and insurance activities (4 percent), and transportation (4 percent). For additional details, refer to Table 3.

Figure 10. Weighted average log labor productivity by sector, 2014-2021 (constant 2010 prices)




Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

## 4.3. Results of productivity analyses

Labor productivity of formal firms in Zambia has declined in aggregate between 2014 and 2021. Fundamentally, changes in labor productivity can be driven by within-firm productivity changes (changes in technical efficiency), the reallocation of resources (labor, in the case of labor productivity) between firms of different productivity levels within a sector, reallocation of resources across sectors (i.e., structural transformation), and the entry and exit of firms. In general, the most consistent contributor to the decline in labor productivity of formal firms has been within-firm declines (see Figure 11). These within-firm declines have largely been driven by non-mining industry and services (whereas labor productivity has grown in agriculture and mining) as will be discussed in a subsequent section. By contrast, the contribution of between-firm reallocation within sectors and structural transformation has been relatively muted, reflecting the relatively stable allocation of resources during the study period.[9] Notably, the distribution of firm productivity moved towards the left over the study period, implying that the declines in labor productivity were widespread across the population formal firms rather than driven by outliers or specific large firms (see Figure 13).

At the same time, this cumulative change belies significant year-to-year volatility in labor productivity growth. For example, labor productivity generally grew between 2014 to 2015, and over the 2017-2020 period. By contrast, there were sharp drops between 2015 and 2016 and between 2020 and 2021 (see Figure 12). As will be discussed in a following section, this volatility is primarily driven by agriculture, forestry, and fishing (reflecting exogenous climate-related shocks) and mining and quarrying (reflecting the combination of high concentration and idiosyncratic shocks to individual firms' performance).

[9] Entry and exit of firms in the dataset have respectively driven decline and growth in average labor productivity. However, because of year-to-year fluctuations in tax compliance at the individual firm level, the data do not allow for definitive conclusions on whether entry and exit seen in the dataset reflect true entry and exit from the market. For example, over half of firms that exited the dataset in 2014 (i.e., those that do not appear in 2015) appear in a subsequent year after 2015. As such, while the quantitative analyses incorporate entry and exit to strip out the effects of the extensive margin, this paper does not focus on drawing conclusions from the entry and exit data.

Figure 11. Cumulative change in weighted average log labor productivity, 2014-2021 (constant 2010 prices)

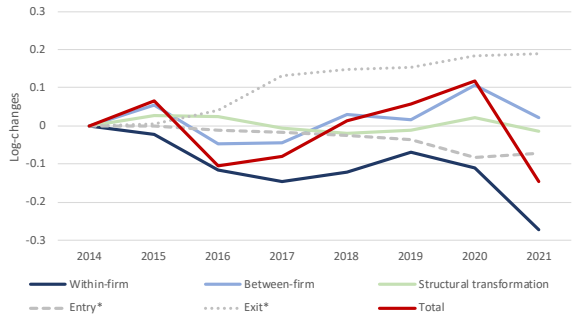
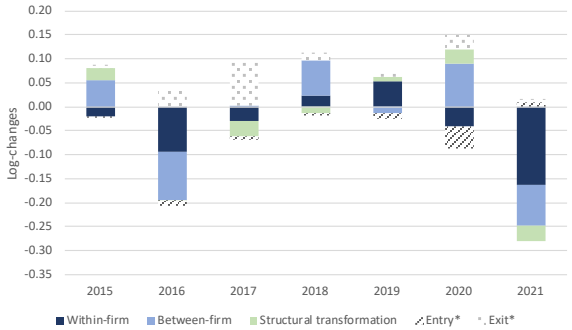
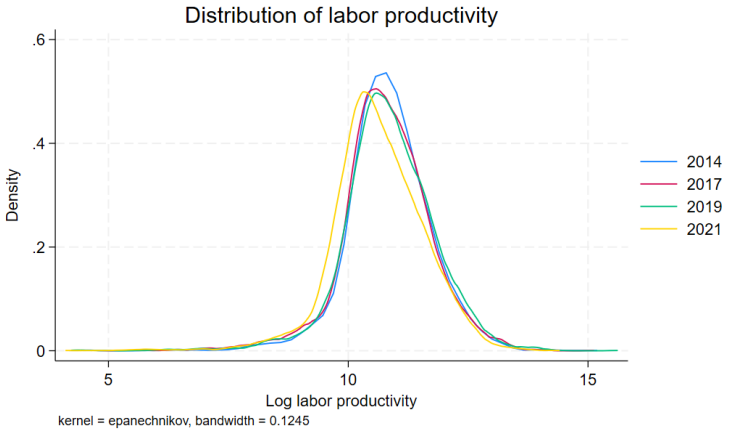



Figure 12. Annual change in weighted average log labor productivity, 2014-2021 (constant 2010 prices)




Note: Averages are weighted by firms' share of labor. Source: World Bank and ZRA staff calculations based on CIT database

Figure 13. Distribution of firm-level labor productivity

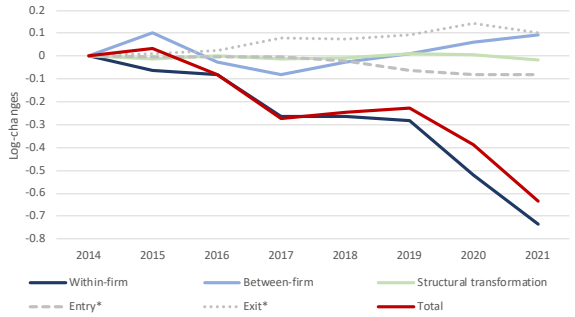



Source: World Bank and ZRA staff calculations based on CIT database

### 4.3.1. Productivity trends in non-mining industry and services

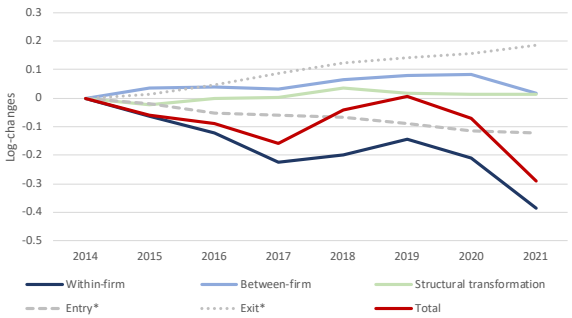
Non-mining industry and services have been the primary drivers of the aggregate decline in labor productivity for formal firms. Between 2014 and 2021, both sectors have seen steep drops in productivity, primarily driven by within-firm declines. The drop in non-mining industry has been especially steep, and these patterns are consistent across nearly all the largest non-mining industrial subsectors (i.e., manufacturing, construction) and the largest non-industrial service subsectors (i.e., wholesale and retail trade, transportation, and financial services) (see Figure 14-Figure 21). These declines in labor productivity across non-mining industry and services are in line with labor productivity trends seen in the broader macroeconomic data. On an economy-wide basis, TFP and labor productivity both declined in Zambia for much of the last decade (World Bank 2024).

Figure 14. Cumulative change in weighted average log labor productivity, 2014-2021 (non-mining industry, constant 2010 prices)



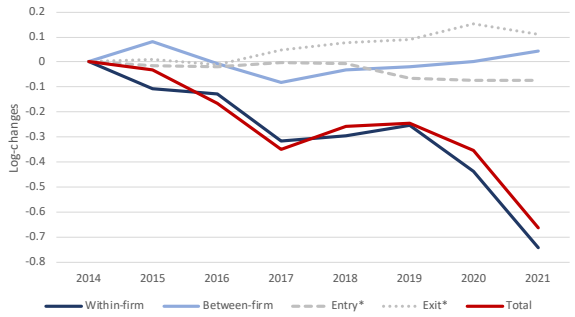

Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

Figure 15. Cumulative change in weighted average log labor productivity, 2014-2021 (non-industrial services, constant 2010 prices)



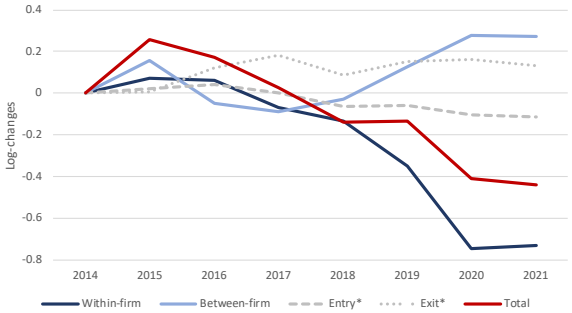

Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

Figure 16. Cumulative change in weighted average log labor productivity, 2014-2021 (manufacturing, constant 2010 prices)



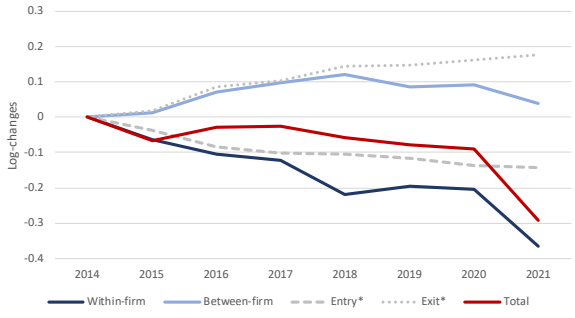

Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

Figure 17. Cumulative change in weighted average log labor productivity, 2014-2021 (construction, constant 2010 prices)



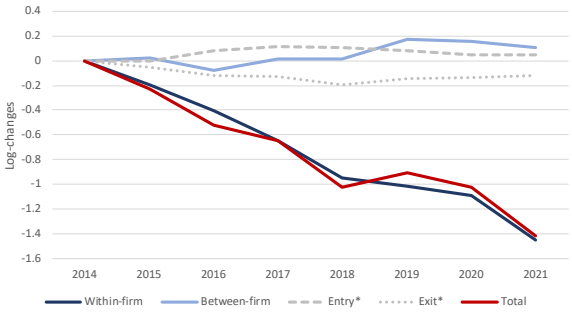

Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

Figure 18. Cumulative change in weighted average log labor productivity, 2014-2021 (retail trade, constant 2010 prices)



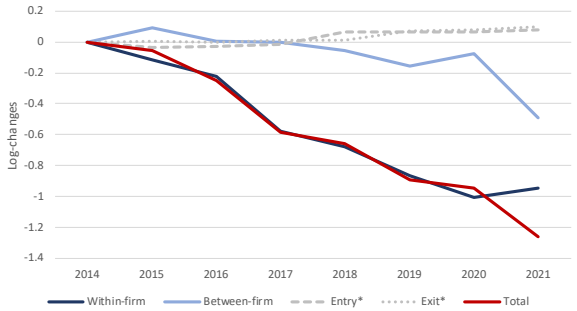

Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

Figure 19. Cumulative change in weighted average log labor productivity, 2014-2021 (wholesale trade, constant 2010 prices)



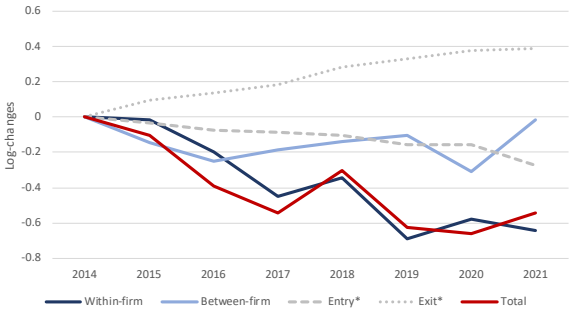

Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

Figure 20. Cumulative change in weighted average log labor productivity, 2014-2021 (transportation and storage, constant 2010 prices)




Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

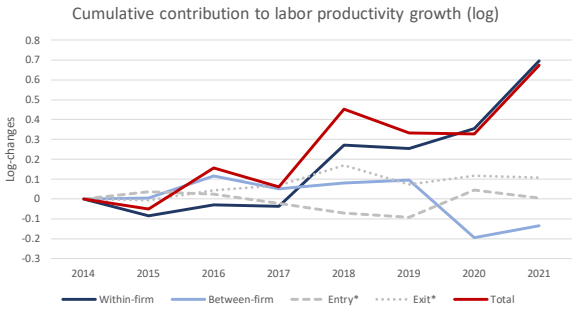
Figure 21. Cumulative change in weighted average log labor productivity, 2014-2021 (financial services, constant 2010 prices)




Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

The most notable exception to this overall trend is the accommodation and food service subsector, which has experienced overall productivity growth over the 2014-2021. Further study is needed to assess the drivers of the sector's strong labor productivity performance, but the broad trend may be related to recent high-profile foreign direct investment (FDI) in the sector, including the acquisition of the Protea Hotels brand by Marriott and subsequent expansion of the Protea Hotel in Lusaka, the acquisition of the InterContinental Hotel Lusaka by Mauritius-based QG Africa Hotel, and acquisition of a portion of Sun International's portfolio (including the Royal Livingstone Hotel) by the Thailand-based Minor Hotels. The sector has also experienced steady growth in its share of formal firms' labor (from 1.8 percent in 2014 to 3.1 percent in 2021), although its aggregate share of formal firm employment remains modest (see Figure 22).

Figure 22. Cumulative change in weighted average log labor productivity, 2014-2021 (accommodation and food service, constant 2010 prices)




Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

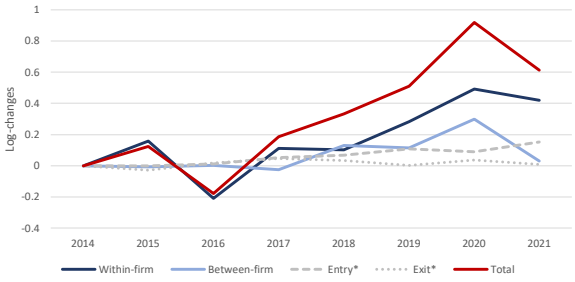
### 4.3.2. Productivity trends in agriculture, forestry, and fishing

In contrast to trends in other segments of the economy, formal firms in agriculture, forestry, and fishing have actually experienced steady increases in labor productivity over the 2014-2021 period, driven by within-firm growth (see Figure 23). The divergence between the formal firms in the CIT dataset and broader agricultural trends in Zambia reflects how the firms in the CIT dataset are often large-scale commercialized farms. Such farms have a relatively greater ability to leverage Zambia's strong resource

endowments thanks to higher investments in productivity-enhancing technological and process improvements, diversification away from maize, and ability to tap into global value chains and export markets. Formal agricultural firms' strong performance also underscores the potential for increased commercialization and adoption of improved technology to drive jobs and economic transformation in Zambia despite the headwinds to overall agricultural productivity growth highlighted in World Bank (2024). Nevertheless, formal agricultural firms account for an as yet marginal portion of the total agricultural labor force (only an estimated 119,000 workers). In general, large-scale commercialized farms—of which the firms in the CIT database are a subset—only farm about 0.7 percent of Zambia total cropped area and represent less than 0.08 percent of all farming entities, highlighting the scale of both the potential opportunity and need to drive increased commercialization (World Bank 2024).

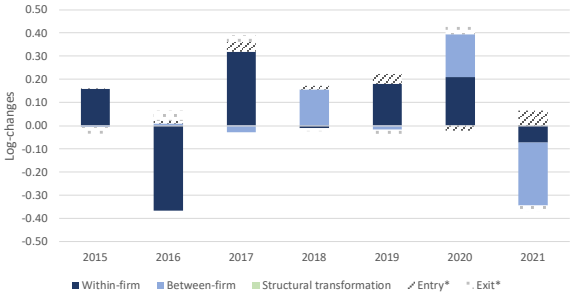
At the same time, the analyses also highlight key climate change-related vulnerabilities faced by formal agricultural firms—as well as farmers in Zambia write large—that drive significant year-on-year volatility. A notable exception to the general upward trend in labor productivity was a sharp drop in 2016 (see Figure 24). This sudden deterioration was driven by an intense drought in 2015-2016, attributable to El Niño and climate change, which translated into steep within-firm productivity declines (Alfani, et al. 2019). Looking forward, climate change is likely to exacerbate the likelihood and intensity of such extreme climactic shocks, highlighting the need to increase resilience of the sector (Thorton and Lipper 2014). Interestingly, although the impact of the 2015-2016 drought is evident in the data, there is no similarly steep drop in productivity in 2019, when Zambia experienced another drought. Formal agricultural firms' relatively strong performance it attributable to the 2019 drought being relatively less intense and the relative concentration of large commercial farms in the Copperbelt and Easter provinces, which were less affected by drought.

Figure 23. Cumulative change in weighted average log labor productivity, 2014-2021 (agriculture, forestry, and fishing; constant 2010 prices)




Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

Figure 24. Annual change in weighted average log labor productivity, 2014-2021 (agriculture, forestry, and fishing; constant 2010 prices)



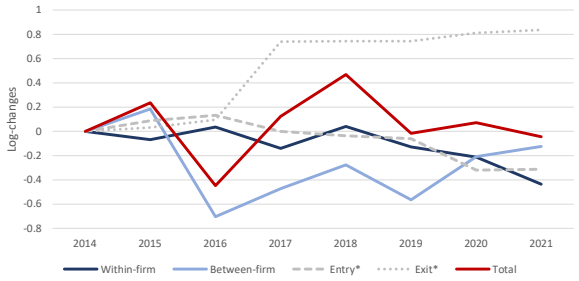

Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

### 4.3.3. Productivity trends in mining

As with agriculture, forestry, and fishing, the mining and quarrying sector has also avoided the secular labor productivity declines seen in other sectors, but it has been subject to even more extreme year-to-year volatility. Overall average labor productivity levels among formal mining and quarrying firms for 2021

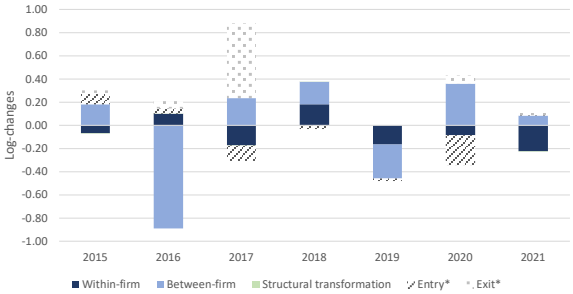
are roughly in line with 2014 levels in log terms and somewhat higher in level terms (see Figure 25).[10] However, unlike with agriculture, there is not a clearly discernible secular trend, with growth and even overall productivity levels fluctuating significantly on a year-to-year basis (see Figure 26).

Figure 25. Cumulative change in weighted average log labor productivity, 2014-2021
(mining and quarrying; constant 2010 prices)




Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

Figure 26. Annual change in weighted average log labor productivity, 2014-2021
(mining and quarrying; constant 2010 prices)




Note: Averages are weighted by firms' share of labor.
Source: World Bank and ZRA staff calculations based on CIT database

Fluctuations in labor productivity in the mining sector are largely due to idiosyncratic factors within individual firms operating in the sector. The between-firm component—corresponding to changes in the correlation between firms' market share and productivity—was the primary driver of changes in productivity over the 2014-2021 period (see Figure 26). This trend reflects how the mining sector has a high level of industry concentration and individual mines are subject to significant operational variability from year to year (for instance, variation in ore grade or unexpected disruptions). For example, the sharp decrease in productivity seen in 2016 was due to safety incidents that occurred in some of the largest copper mines in Zambia, which led to temporary closures. On the other hand, the sharp increase in productivity in 2017 was due to the rapid expansion of a newly opened mine that employed the latest technology (i.e., a high-productivity firm), resulting in improved efficiency in resource allocation.[11]

# 5. Firm dynamics and formal job flows

## 5.1. Methodology for jobs analyses

This paper analyzes trends in the stock, flow, and wages of formal jobs in Zambia by leveraging the PAYE database. Paying into PAYE taxes serves as a proxy for formal employment. For the purposes of this paper, formal employment (i.e., jobs covered by PAYE taxes) can occur at both formal firms (i.e., firms paying into CIT) and informal firms. Similarly, formal firms may have both formal and informal employees. We define one formal full-time equivalent worker (FTE) as 12 monthly returns to account for seasonal labor. Wages are annualized and deflated by the Consumer Price Index (CPI) to align real wages to spending power.

[10] The slight difference in trend between the two measures stems from the convexity of natural log function.
[11] Analyses of mining sector performance are based on interviews with Zambia Revenue Authority staff and the annual reports of relevant mining companies in Zambia. Due to the sensitive nature of the firm-level tax data, further details on the specific firms cannot be disclosed.

The definitions of survivor, entrant and exiter firms are in line with the definitions used for the productivity analyses. Using these definitions, the change in formal employment can be decomposed as follows:

$$\Delta L_{j,t} = \Delta L_{j,t}^{Expansion} + \Delta L_{j,t}^{Contraction} + L_{j,t}^{Entrant} - L_{j,t-1}^{Exiter},$$

where *L* denotes the total FTE, *Expansion* refers to survivor firms whose formal labor forces grew in FTE terms, *Contraction* refers to survivor firms whose formal labor forces shrank in FTE terms, *j* indexes sectors, and *t* indexes years.

Changes in wages of formal employees can be decomposed in a similar way as productivity in prior analyses in this paper as follows:

$$\Delta w_t = \sum_j \lambda_{j,t} \Delta w_{j,t}^{survivor} + \sum_j \lambda_{j,t} \Delta Cov_{j,t}^{survivor} + \sum_j \lambda_{j,t} Entry_{j,t} + \sum_j \lambda_{j,t} Exit_{j,t-1} + \sum_j \Delta\lambda_{j,t} \Omega_{j,t-1},$$

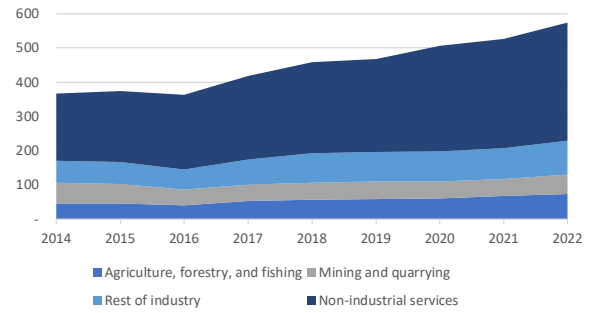
where *w* denotes log real (annualized) wage, and the rest of the terms hold the same definitions as in the productivity analyses, except with log real wages as the variable interest rather than labor productivity.

## 5.2. Descriptive overview of formal jobs in the Zambia PAYE database

In 2021, the PAYE dataset contained information on over 800,000 unique workers who filed over 6.3 million monthly returns. Although the number of formal jobs has been increasing over time, they still constitute a relatively small subset of Zambia's working-age population. The estimated number of full-time equivalent formal workers in the PAYE dataset rose from 366,417 in 2014 to 574,142 in 2022 (see Figure 27). This figure constitutes a subset of the estimated 848,413 formal workers cited in the 2021 Labour Force Survey for Zambia, reflecting the slightly different definition in formal worker between this paper (i.e., paying into PAYE) and the Labour Force Survey (i.e., covered by social security). In general, due to tax reporting thresholds, the PAYE definition constitutes a lower definition. The estimates based on the PAYE definitions are also in roughly line with estimated labor at formal firms paying CIT (526,649).

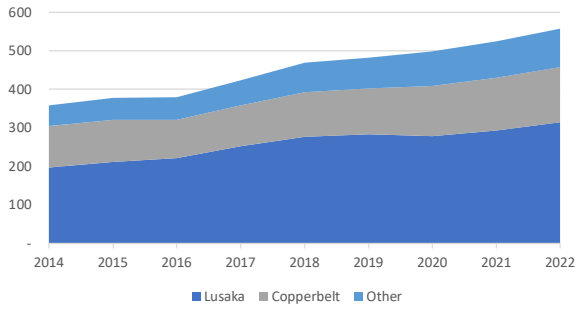
The majority of formal employment is in the service sector, followed by non-mining industry, agriculture, and mining. The mining sector has seen a decline in its share of formal employment over time, while agriculture and service sectors have experienced growth, with the wholesale and retail trade being the major contributor to service employment. Firms registered in the Lusaka and Copperbelt provinces account for the highest number of formal jobs. (Figure 28). Large firms (defined in this paper as having more than 100 employees, in line with Government of Zambia regulations) account for about 70 percent of formal employment, medium firms for 10 percent, and micro and small firms for 20 percent (see Figure 29).

Figure 27. Total formal employment by sector, 2014-2022 (FTE)




Note: FTE defined as 12 monthly returns to account for seasonal employment.
Source: World Bank and ZRA staff calculations based on PAYE database

Figure 28. Total formal employment by province of employer registration, 2014-2022 (FTE)




Note: FTE defined as 12 monthly returns to account for seasonal employment. Data on province of employment (as opposed to registration location of employer) is not sufficiently complete for analysis. In some cases (most commonly in agriculture), the employer's province of registration may differ from actual province of operations. Slight differences in totals with other charts are attributable to completeness of provincial data.
Source: World Bank and ZRA staff calculations based on PAYE database

Figure 29. Total formal employment by size of firm, 2014-2022 (FTE)

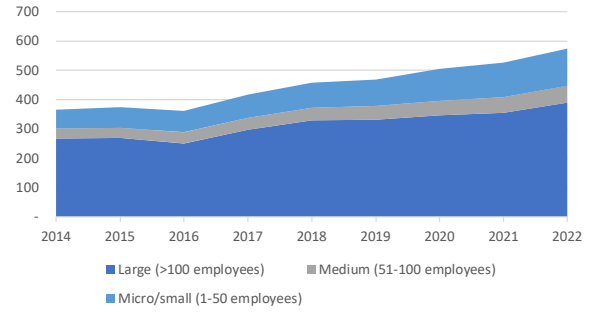



Figure 30. Year-on-year change in formal employment by driver, 2014-2022 (FTE)


Note: FTE defined as 12 monthly returns to account for seasonal employment.
Source: World Bank and ZRA staff calculations based on PAYE database

## 5.3. Results of jobs analyses

In line with labor productivity trends, real wages have declined in Zambia across several subsectors. Real wage declines have been driven by within-firm real wage deterioration, pointing to the broad-based nature of wage declines as productivity and pay have struggled to keep pace with inflation (Figure 31). The average Zambian formal worker in the PAYE dataset earned over ZMK 73,000 annually in 2014, which decreased by almost half to about ZMK 39,000 in 2022 (in constant 2010 ZMK terms). This pattern is consistent across a wide array of sectors and subsectors (Figure 32)—real wages for formal workers have declined in mining and quarrying, manufacturing, construction, wholesale and retail trade, financial services, and transport. Real wage declines in the formal sector are also in line with real wage declines in Zambia (i.e., for both formal and informal workers). These are observed in Zambia's Labour Force Survey data: between 2017 and 2021, real average monthly earnings declined by 24 percent (Zambia MLSS 2022). An exception to this trend is formal workers in agriculture, forestry, and fishing, which is in line with the sector's relatively stronger labor productivity performance. Although formal workers in this sector

continue to have lower wages than in other sectors, real wages remained stable over this period and actually increased in the last year of the study period.

Figure 31. Cumulative change in log real wage, 2014-2022 (base year: 2010)

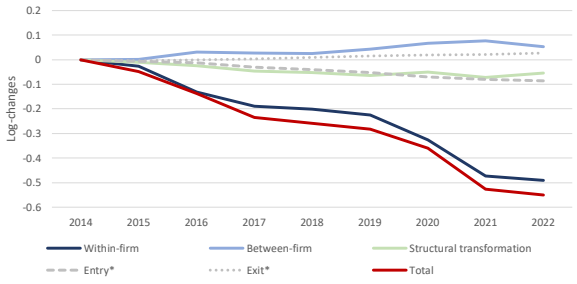
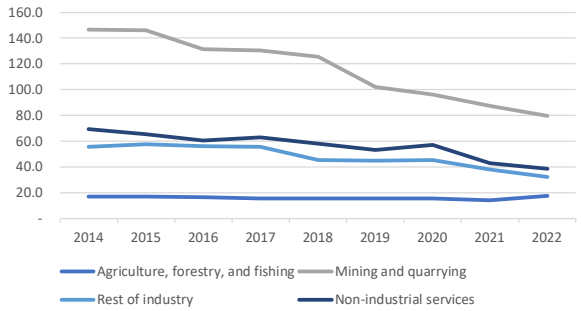



Figure 32. Real wage by overall sector, 2014-2022 (thousand 2010 ZMK)

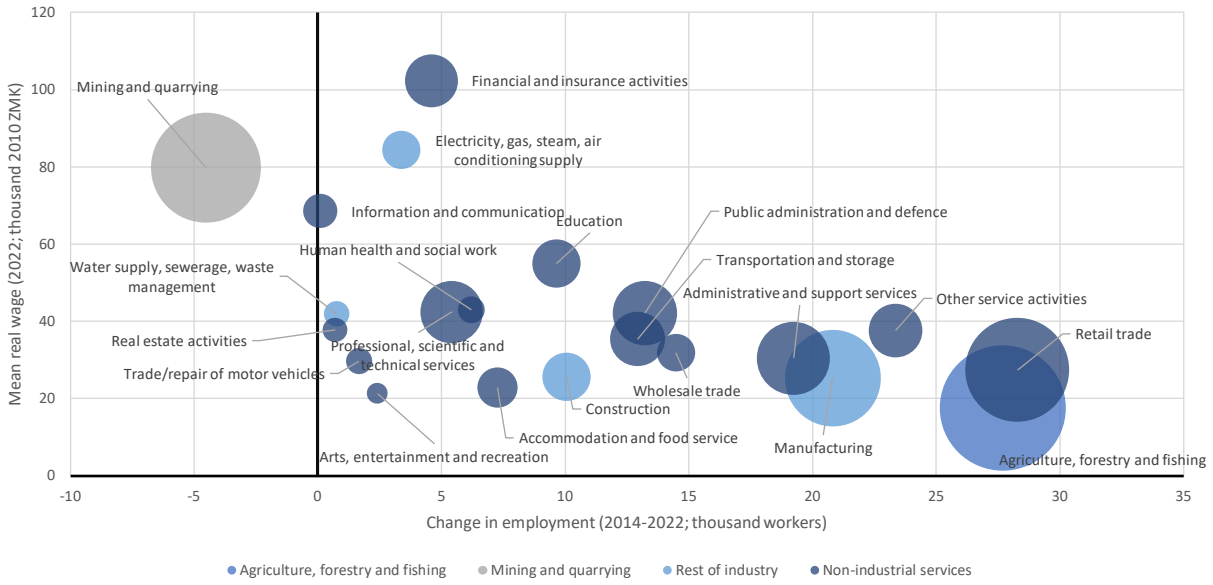



Note: Wages are deflated by Consumer Price Index (CPI).
Source: World Bank and ZRA staff calculations based on PAYE database

**Net formal job creation has generally been in lower paying subsectors.** At the ISIC 1-digit level, the largest net formal job creators have been agriculture, forestry and fishing (about 28,000 net new jobs between 2014 and 2022), retail trade (28,000), manufacturing (21,000), and other service activities (23,000),[12] all relatively low-wage sectors. By contrast, there has been limited new formal job creation in financial services (5,000 new jobs), the highest-wage subsector, and there has been net formal job destruction in mining (5,000 fewer jobs in 2022 versus 2014), the third highest paying subsector (see Figure 33). As a result, although not quite as stark as the impact of within-firm real wage declines, across-sector shifts in the formal workforce have also contributed to average real wage declines for formal workers in Zambia. In general, formal job creation in lower-paying subsectors may still translate into better livelihoods on a net basis for Zambians as a whole insofar as workers are transitioning from lower-paying informal jobs. However, this trend highlights the limited remaining job-creating potential in mining—which is constrained by natural resource endowments—as well as the still untapped potential for job creation at scale in higher value-added service subsectors such as financial services and information technology.

[12] In Zambia, this mostly accounts for personal care and service jobs.

Figure 33. Change in formal employment, mean real wage, and total formal employment by ISIC 1-digit subsector, 2014-2022




Note: Bubble size corresponds with 2022 formal employment.
Source: World Bank and ZRA staff analysis based on PAYE database

## 6. Discussion

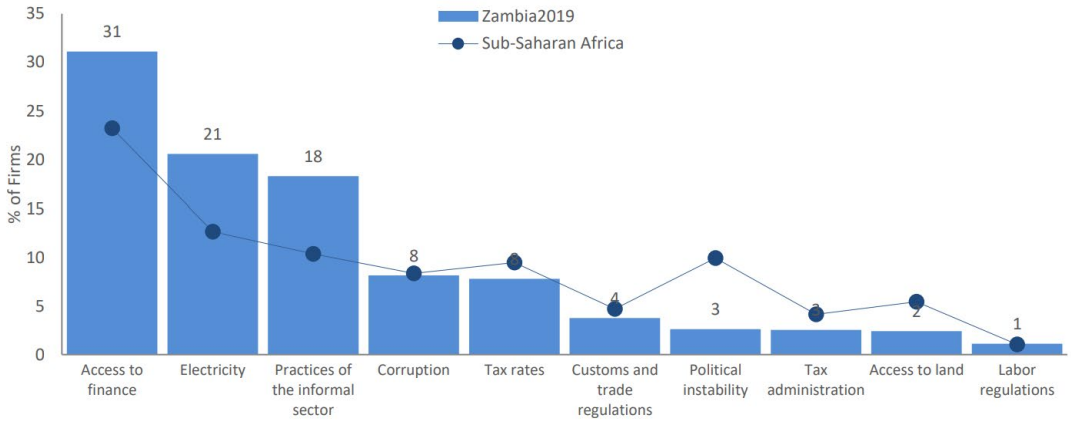
That the within-firm component is the main drag on labor productivity and wage growth across various sectors suggests that economy-wide productivity constraints are a critical factor in Zambia. Cross-cutting factors such as poor infrastructure, burdensome regulations, and low technology adoption are more likely to affect firms and sectors similarly, thus impacting the within-firm component of productivity growth and leading to broad-based declines across sectors. By contrast, distortions to competition from entry barriers, policies that create an uneven playing field, and poor enforcement of anticompetitive behavior are more likely to impact allocative efficiency (the between-firm, entry, exit, and structural transformation components of productivity growth). The salience of the within-firm component in explaining productivity and wage declines in Zambia underscores the severity of business environment and firm capability constraints in the country.

Moreover, Zambia stands out from other developing countries for which similar analyses have been conducted. Analyses in other countries such as Croatia, Côte d'Ivoire, Ecuador, and Türkiye have often found the between-firm component to be the main drag on productivity growth, indicating allocative efficiency problems (Patiño Peña and Ferro Forthcoming, World Bank 2022a, World Bank 2021a, World Bank 2019a). It is less common to see economy-wide productivity declines driven by the within-sector component, although a study in Kosovo came to similar findings (World Bank 2021b). We now analyze specific business environment constraints that are especially salient and relevant to firm productivity—and, by extension, wage—trends in Zambia.

Recent evidence suggests that labor productivity declines within formal firms in non-mining industry and services partly reflect business environment constraints. Over 600 Zambian firms across manufacturing, construction, wholesale and retail trade, hotels, restaurants, transportation, and information technology

were surveyed between 2019 and 2020 for the World Bank Enterprise Survey. When respondents were asked about the biggest obstacles to their business, the most cited factors were access to finance (cited by 31 percent of respondents as their top obstacle), electricity (21 percent),[13] and practices of the informal sector (18 percent) (World Bank 2020b). The rates at which these obstacles were cited were well above the averages for Sub-Saharan Africa (Figure 34).

Figure 34. Top reported business obstacle in Zambia, 2019
(Percent of latest Enterprise Survey Respondents)



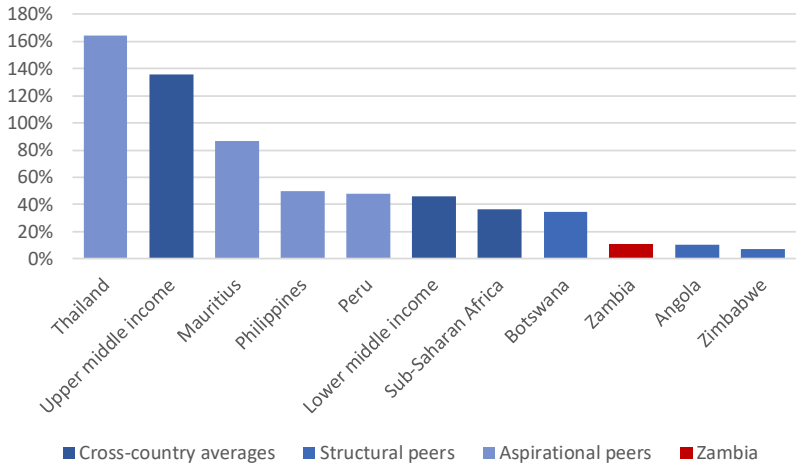

Source: World Bank (2020b)

## 6.1. Access to finance

Inadequate access to finance constrains Zambian firms' ability to make productivity-enhancing investments. It was the most widely cited constraint in the latest Enterprise Survey for Zambia across all firm sizes (World Bank 2020b). Zambia faces financial intermediation challenges, and little domestic credit flows to the private sector compared to aspirational peers, amounting to just 11.3 percent of GDP in 2021 (Figure 35). The loans that are made tend to be expensive: Commercial banks' average published nominal lending rates were above 25 percent in June 2023, and lending rates for micro-finance institutions catering to smaller firms and individuals are even higher (Bank of Zambia 2023). As a result, relatively few Zambian firms are able to access to credit. Only 10 percent of Zambian Enterprise Survey respondents report having a bank loan or line of credit, and 34 percent of Zambian Enterprise Survey respondents who reported applying for loans recently saw their loan applications rejected. Despite the prevalence of banks vis-à-vis other sources of finance, less than 9 percent of Zambian Enterprise Survey respondents report having used bank financing for capital investments, and less than 5 percent report having used it for working capital (World Bank 2020b).

[13] Electricity access issues may have been especially pronounced in 2019 given electricity generation issues driven by drought and resulting impacts on hydropower. Nevertheless, electricity was also the third most cited constraint in the Enterprise Survey for Zambia in 2013, highlighting the persistence of the issue (World Bank 2014).

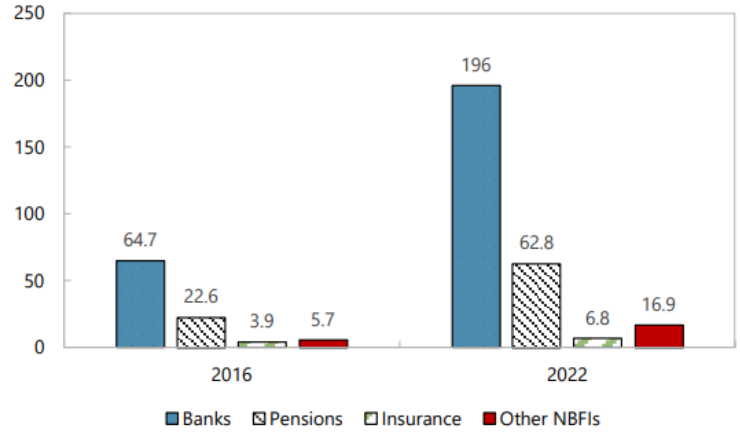
Figure 35. Domestic credit to the private sector, 2021
(Percent of GDP)




Source: World Bank (2020b)

The financial sector's market structure and low risk tolerance constrain access to finance. Banking sector assets account for around 41 percent of GDP, with the rest of the financial sector—including smaller nonbank financial institutions (NBFIs) such as pension funds, insurance companies, and micro-finance institutions—accounting for only 18 percent. NBFI assets are small and not critical in income securitization or asset creation for underserved segments in Zambia (Figure 36). Other alternative funding sources such as venture capital, private equity, crowd funding, and capital markets remain undeveloped (Government of the Republic of Zambia 2017). Banking credit to the private sector has been decreasing over the past few years as a percentage of GDP and lags nominal GDP growth, reflecting the banking sector's preference to invest in lower-risk, high-earning investments in government securities (IMF 2023). Banks generally provide little flexibility in collateral requirements, have made few innovations in credit products, and have complex credit application processes (IMF 2023).

Figure 36. Zambia Financial Sector Structure, Assets in Kwacha (Billions)




Source: Bank of Zambia and IMF staff calculations (IMF, 2023)

## 6.2. Firm-level capabilities and skills

Poor labor productivity trends among formal Zambian firms in the non-mining industry and service sectors also reflect firm-level capability and technological constraints. Firms often lack critical managerial, technological, and vocational skills. The Zambian training system provides inadequate training with respect to business and entrepreneurial skills, which are necessary for the establishment and growth of businesses (Government of the Republic of Zambia 2020). A relatively low percentage of firms in Zambia have licenses for the use of international technologies (Figure 37) or have internationally recognized quality certifications (Figure 38), proxies for the level of technology adoption, and managerial and operational sophistication. As a result, Zambia ranks 100th out of 132 countries with respect to business sophistication in the World Intellectual Property Organization's Global Innovation Index (2022), below countries such as Peru (49th), Thailand (43rd), and even Zimbabwe (90th) (World Intellectual Property Organization 2022).

Figure 37. Firms using technology licensed from foreign companies
(Percent of latest Enterprise Survey respondents)

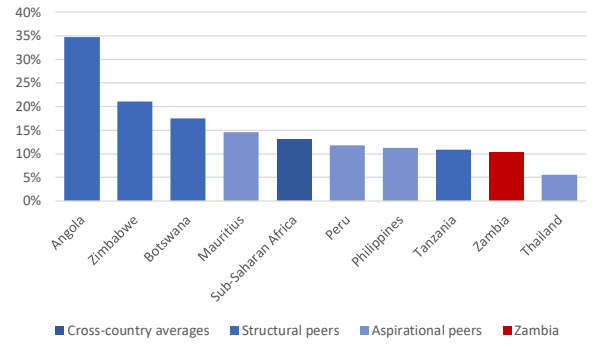
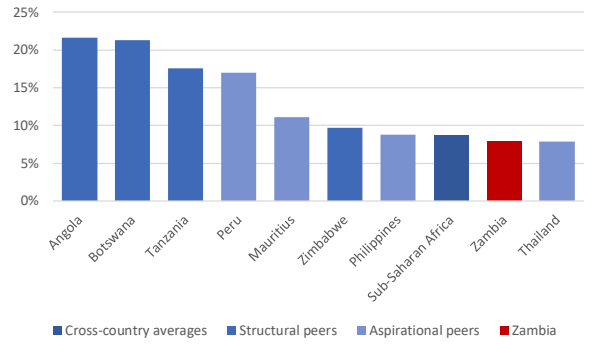



Figure 38. Firms with international recognized quality certification
(Percent of latest Enterprise Survey respondents)

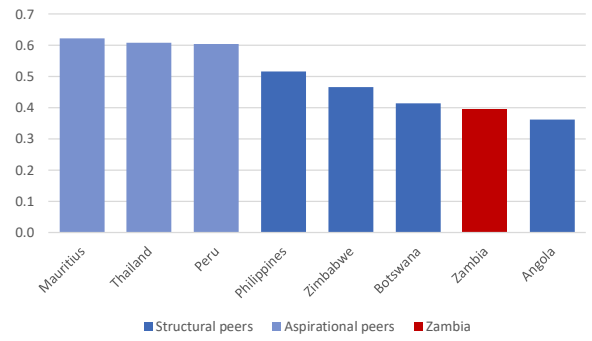



Note: Select aspirational peers such as Thailand also have lower scores, although in such cases the low score reflects the ready availability of domestically developed technology rather than low business sophistication.
Source: World Bank staff calculations based on Enterprise Survey data and the Investment Climate Assessment 2.0 toolkit

Zambian firms also face skills and capability constraints at the worker level. Zambia's Human Capital Index (HCI)—a measure of health and education's contribution to worker productivity—is well below most aspirational and structural peer countries (Figure 39).[14] Zambian firms are unable to overcome these challenges after onboarding workers. Although a high portion of formal Zambian firms report offering formal training, they offer it to a low share of workers (Figure 40).

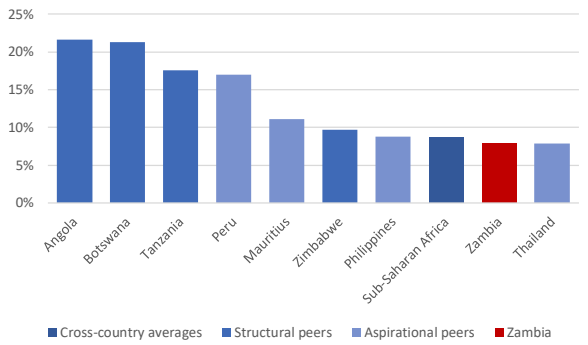
[14] The HCI calculates the contributions of health and education to worker productivity. The final index score ranges from zero to one and measures the productivity as a future worker of child born today relative to the benchmark of full health and complete education.

Figure 39. Human Capital Index, 2020




Note: The index calculates the contributions of health and education to worker productivity. The final index score ranges from zero to one and measures the productivity as a future worker of child born today relative to the benchmark of full health and complete education.
Source: World Bank WDI

Figure 40. Proportion of workers offered formal training (Average of latest Enterprise Survey respondents)

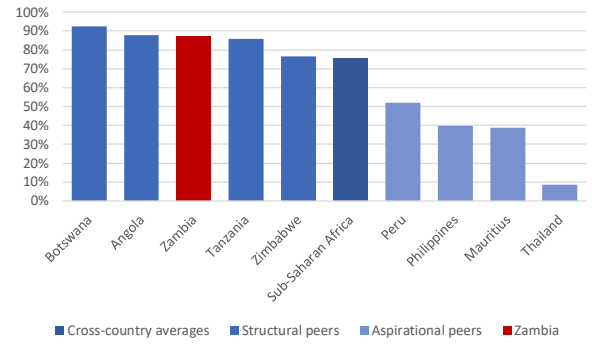



Source: World Bank staff calculations based on Enterprise Survey data and the Investment Climate Assessment 2.0 toolkit

## 6.3. Access to electricity

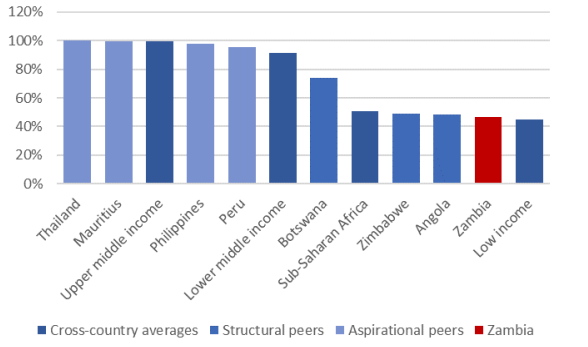
Subpar access to electricity also imposes constraints on firm-level labor productivity. In Zambia, one-fifth of Enterprise Survey respondents report that electricity access is their top business environment constraint. Less than half of the population has access to electricity. Even where there is access, the quality of electricity supply is low. Over 80 percent of respondent firms experience outages—lasting 10 hours on average—well above structural and regional peers (Figure 41). The average respondent suffers losses of nearly 20 percent of revenue due to electricity outages (World Bank 2020b).

Figure 41. Firms experiencing blackouts (Percent of latest Enterprise Survey respondents)




Source: World Bank staff calculations based on Enterprise Survey data and the Investment Climate Assessment 2.0 toolkit

Figure 42. Access to electricity, 2021 (Percent of population)




Source: World Bank WDI

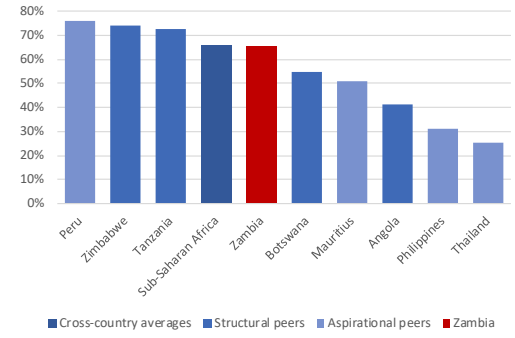
Poor electricity access and quality reflect the country's dependence on hydropower and increasing climate hazards as well as structural challenges related to the power sector. Hydropower accounts for over 80

percent of installed power generation capacity, making the country vulnerable to droughts. Droughts in 2015/2016 and 2019 led to blackouts and power rationing (UNCTAD 2022). Financial challenges at the state-owned electricity utility, a weak coordinating environment, and limited private sector participation further contribute to electricity issues in Zambia (UNECA 2021, UNCTAD 2022).

## 6.4. Regulatory environment and confluence with informality

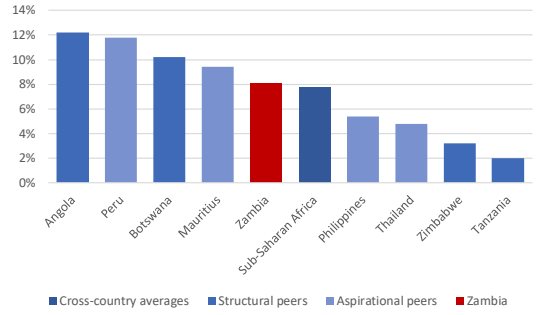
Formal firms in Zambia compete heavily with informal firms, reflecting difficulties in accessing higher-value markets and amplifying distortions from excessive formal regulatory and tax burdens. Informal firms may hinder the scale-up of formal competitors if their informal status provides them with cost or operational advantages (e.g., lower regulatory or tax burdens), creating an uneven playing field (Amin, Ohnsorge and Okou 2019). Since informal firms are not covered in this analysis, their impact on productivity can be observed as productivity declines among formal firms that experience sales or margin declines, rather than as cross-firm reallocation of resources. According to the 2019 Enterprise Survey, nearly 65 percent of firms compete with informal firms—higher than many peer countries— (Figure 43) and informal sector practices are the third-most cited business environment obstacle. These competitive distortions result from informal competition coinciding with burdensome requirements for formal firms. Senior managers of formal firms in Zambia report spending 8 percent of their time dealing with regulatory requirements, higher than the averages for SSA and aspirational peers (Figure 44). Competition with the informal sector may also reflect weak market access, forcing formal firms to compete with informal firms for a limited pool of local customers.

Figure 43. Firms competing with informal firms (Percent of latest Enterprise Survey respondents)




Source: World Bank staff calculations based on Enterprise Survey data and the Investment Climate Assessment 2.0 toolkit

Figure 44. Senior management time spent on regulatory requirements (Average of latest Enterprise Survey respondents)




Source: World Bank staff calculations based on Enterprise Survey data and the Investment Climate Assessment 2.0 toolkit.

# 7. Conclusion

Aggregate labor productivity of formal firms weakened between 2014 and 2021, driven by secular within-firm declines in the non-mining industry and service sectors. By contrast, labor productivity grew in agriculture and remained flat in mining over the same period. Real wage trends for formal workers have mostly mirrored labor productivity dynamics, declining 40-50 percent across non-agriculture sectors but growing slightly in agriculture, largely driven by within-firm shifts rather than between-firm or between-sector dynamics. The declines in labor productivity and wages reflect business environment challenges related to access to finance and electricity, as well as burdensome formal compliance

requirements and competition with the informal sector. Within-firm labor productivity challenges also reflect low skills and capacity—including low technology adoption—among both firms and workers.

These findings suggest that financial and business environment reforms are needed to unlock the private sector's role in driving jobs and economic transformation. To improve access to finance, Zambia could consider dismantling arrears, scaling up and refining credit guarantee schemes for private sector lending, improving financial infrastructure (e.g., credit information systems), and working with financial intermediaries to diversify product offerings. Regulatory streamlining—including for trade and foreign direct investment—would help decrease competitive distortions from competition with the informal sector and increase exports and FDI, which are critical channels for productivity improvement. Energy sector reforms such as improved systems planning would help to increase the quality of and access to electricity for firms and citizens alike. At the firm level, programs to enhance technology transfer linkages between anchor firms and their suppliers and buyers could help Zambian firms upgrade their capacity and improve productivity, as could programs to directly promote technology use by firms. At the same time, investments in water management and other climate change mitigation and adaptation measures will be critical to build resilience and reduce volatility.

Further research priorities related to firm productivity and wages in Zambia could include more detailed analysis of how specific policy issues, access to finance, infrastructure, and capability gaps interact with firm productivity (e.g., the impact of FDI on firm productivity within Zambia) and pay as well as analysis of wage dynamics and inequality within firms across individual workers. The CIT and PAYE data utilized in this paper could also be used to conduct research related to revenue mobilization and tax compliance.

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# Annex 1: Detailed descriptive statistics

Table 2. Share of real value added from formal firms by ISIC 1-digit sector (CIT database; constant 2010 prices)

| ISIC 1-digit sector | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|
| Agriculture, forestry and fishing | 7.3% | 8.1% | 6.8% | 11.1% | 11.1% | 16.1% | 17.7% | 18.6% |
| Mining and quarrying | 12.0% | 24.7% | 19.2% | 24.7% | 24.0% | 17.9% | 26.1% | 20.3% |
| Manufacturing | 14.0% | 12.6% | 12.7% | 9.4% | 9.8% | 11.2% | 9.1% | 7.2% |
| Electricity, gas, steam and air conditioning supply | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Water supply; sewerage, waste management and remediation | 1.6% | 1.1% | 1.0% | 0.6% | 0.4% | 0.4% | 0.1% | 0.1% |
| Construction | 3.3% | 5.1% | 4.0% | 3.4% | 2.4% | 2.4% | 1.6% | 2.5% |
| Trade and repair of motor vehicles and motorcycles | 1.2% | 1.1% | 1.2% | 1.0% | 0.6% | 0.7% | 0.7% | 0.8% |
| Wholesale trade | 4.2% | 3.4% | 3.8% | 5.1% | 3.4% | 3.9% | 4.2% | 4.1% |
| Retail trade | 15.5% | 13.8% | 16.8% | 14.6% | 11.8% | 11.2% | 10.1% | 9.9% |
| Transportation and storage | 3.1% | 2.6% | 2.2% | 1.4% | 1.5% | 1.2% | 1.3% | 1.5% |
| Accommodation and food service | 1.8% | 1.9% | 2.5% | 2.0% | 2.2% | 2.0% | 2.0% | 3.1% |
| Information and communication | 14.2% | 4.4% | 6.3% | 5.5% | 7.6% | 5.5% | 5.4% | 14.0% |
| Financial and insurance activities | 9.2% | 7.4% | 8.0% | 5.8% | 7.3% | 4.6% | 3.9% | 5.9% |
| Real estate activities | 0.2% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| Professional, scientific and technical activities | 4.0% | 5.3% | 4.9% | 3.8% | 6.6% | 6.1% | 6.8% | 3.9% |
| Administrative and support service activities | 5.4% | 4.6% | 5.4% | 5.3% | 7.8% | 9.7% | 5.9% | 3.7% |
| Public administration and defence; compulsory social security | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Education | 0.7% | 0.7% | 0.9% | 0.9% | 0.7% | 1.5% | 1.0% | 1.0% |
| Human health and social work | 0.4% | 0.3% | 0.6% | 0.7% | 0.4% | 0.4% | 0.5% | 0.6% |
| Arts, entertainment and recreation | 0.4% | 0.4% | 0.4% | 0.5% | 0.4% | 0.2% | 0.0% | 0.1% |
| Other service activities | 1.3% | 2.1% | 3.3% | 4.1% | 1.7% | 4.8% | 3.2% | 2.6% |
| Activities of households | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

Note: Trade and repair of motor vehicles and motorcycles, wholesale trade, and retail trade split out at ISIC 2-digit level given divergent trends among the large number of firms within the broader 1-digit sector.
Source: World Bank and ZRA staff calculations based on CIT database

Table 3. Share of estimated labor in formal firms by ISIC 1-digit sector (CIT database)

| ISIC 1-digit sector | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|
| Agriculture, forestry and fishing | 19.6% | 19.4% | 18.9% | 21.7% | 22.9% | 24.0% | 21.1% | 22.6% |
| Mining and quarrying | 6.4% | 10.9% | 9.2% | 8.5% | 6.7% | 8.3% | 11.0% | 7.5% |
| Manufacturing | 13.8% | 12.8% | 13.5% | 10.6% | 12.7% | 13.4% | 13.8% | 12.3% |
| Electricity, gas, steam and air conditioning supply | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Water supply; sewerage, waste management and remediation | 1.0% | 0.9% | 0.8% | 0.8% | 0.6% | 0.6% | 0.4% | 0.3% |
| Construction | 5.5% | 5.5% | 4.6% | 5.0% | 4.8% | 4.0% | 4.4% | 4.9% |
| Trade and repair of motor vehicles and motorcycles | 1.4% | 1.4% | 1.3% | 1.3% | 1.2% | 1.1% | 1.2% | 1.3% |
| Wholesale trade | 1.7% | 1.9% | 2.2% | 3.1% | 3.7% | 3.9% | 5.3% | 6.9% |
| Retail trade | 25.1% | 23.3% | 24.7% | 22.6% | 21.1% | 20.4% | 19.6% | 20.2% |
| Transportation and storage | 2.8% | 2.6% | 2.1% | 2.1% | 2.8% | 2.8% | 3.5% | 4.2% |
| Accommodation and food service | 2.4% | 2.9% | 2.7% | 2.5% | 2.0% | 2.1% | 2.1% | 2.1% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Information and communication** | 1.2% | 0.6% | 0.7% | 0.5% | 0.7% | 0.7% | 0.9% | 1.3% |
| **Financial and insurance activities** | 3.8% | 3.3% | 4.4% | 3.8% | 4.1% | 3.8% | 3.5% | 3.9% |
| **Real estate activities** | 0.3% | 0.1% | 0.1% | 0.0% | 0.0% | 0.0% | 0.1% | 0.1% |
| **Professional, scientific and technical activities** | 5.3% | 5.0% | 4.7% | 4.7% | 4.8% | 3.9% | 3.7% | 3.3% |
| **Administrative and support service activities** | 6.4% | 6.0% | 6.4% | 8.6% | 8.3% | 6.7% | 5.1% | 5.1% |
| **Public administration and defence; compulsory social security** | 0.1% | 0.0% | 0.0% | 0.1% | 0.0% | 0.1% | 0.1% | 0.0% |
| **Education** | 0.7% | 0.7% | 0.7% | 0.5% | 0.3% | 0.6% | 0.5% | 0.6% |
| **Human health and social work** | 0.6% | 0.5% | 0.6% | 0.5% | 0.4% | 0.7% | 0.8% | 0.7% |
| **Arts, entertainment and recreation** | 0.6% | 0.6% | 0.5% | 0.6% | 0.6% | 0.5% | 0.3% | 0.2% |
| **Other service activities** | 1.2% | 1.7% | 1.9% | 2.4% | 2.5% | 2.5% | 2.6% | 2.3% |
| **Activities of households** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

Note: Trade and repair of motor vehicles and motorcycles, wholesale trade, and retail trade split out at ISIC 2-digit level given divergent trends among the large number of firms within the broader 1-digit sector.
Source: World Bank and ZRA staff calculations based on CIT database

Table 4. Log labor productivity of formal firms by ISIC 1-digit sector (CIT database; constant 2010 prices)

| **ISIC 1-digit sector** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** |
|---|---|---|---|---|---|---|---|---|
| **Agriculture, forestry and fishing** | 9.94 | 10.06 | 9.76 | 10.12 | 10.27 | 10.45 | 10.86 | 10.55 |
| **Mining and quarrying** | 11.74 | 11.97 | 11.29 | 11.86 | 12.20 | 11.72 | 11.81 | 11.69 |
| **Manufacturing** | 10.98 | 10.96 | 10.82 | 10.64 | 10.73 | 10.74 | 10.63 | 10.32 |
| **Electricity, gas, steam and air conditioning supply** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| **Water supply; sewerage, waste management and remediation** | 11.58 | 11.40 | 11.12 | 10.78 | 10.86 | 10.63 | 10.07 | 10.27 |
| **Construction** | 10.45 | 10.70 | 10.62 | 10.47 | 10.30 | 10.31 | 10.04 | 10.00 |
| **Trade and repair of motor vehicles and motorcycles** | 11.00 | 10.94 | 10.92 | 10.75 | 10.57 | 10.75 | 10.76 | 10.54 |
| **Wholesale trade** | 11.97 | 11.74 | 11.44 | 11.32 | 10.94 | 11.06 | 10.95 | 10.55 |
| **Retail trade** | 10.57 | 10.51 | 10.55 | 10.55 | 10.52 | 10.50 | 10.48 | 10.28 |
| **Transportation and storage** | 11.14 | 11.09 | 10.90 | 10.56 | 10.49 | 10.25 | 10.20 | 9.89 |
| **Accommodation and food service** | 10.74 | 10.69 | 10.90 | 10.80 | 11.19 | 11.08 | 11.07 | 11.42 |
| **Information and communication** | 13.30 | 13.00 | 12.62 | 13.20 | 13.13 | 12.91 | 12.23 | 12.81 |
| **Financial and insurance activities** | 11.93 | 11.83 | 11.54 | 11.39 | 11.63 | 11.31 | 11.27 | 11.39 |
| **Real estate activities** | 10.56 | 11.02 | 10.68 | 11.68 | 12.02 | 11.72 | 10.34 | 10.83 |
| **Professional, scientific and technical activities** | 10.75 | 11.00 | 10.77 | 10.72 | 11.30 | 11.46 | 11.76 | 11.06 |
| **Administrative and support service activities** | 10.90 | 10.83 | 10.69 | 10.38 | 10.98 | 11.32 | 11.14 | 10.66 |
| **Public administration and defence; compulsory social security** | 10.90 | 10.72 | 10.84 | 10.99 | 0.00 | 11.18 | 10.51 | 10.78 |
| **Education** | 11.26 | 11.25 | 11.18 | 11.50 | 11.87 | 11.97 | 11.74 | 11.38 |
| **Human health and social work** | 10.90 | 10.78 | 11.13 | 11.37 | 11.05 | 10.71 | 10.84 | 10.92 |
| **Arts, entertainment and recreation** | 10.88 | 10.71 | 10.76 | 10.73 | 10.69 | 10.47 | 9.04 | 9.90 |
| **Other service activities** | 11.05 | 11.26 | 11.38 | 11.47 | 10.52 | 11.52 | 11.04 | 10.86 |
| **Activities of households** | 9.71 | 9.69 | 0.00 | 10.06 | 8.58 | 9.71 | 10.40 | 8.99 |

Note: Trade and repair of motor vehicles and motorcycles, wholesale trade, and retail trade split out at ISIC 2-digit level given divergent trends among the large number of firms within the broader 1-digit sector.
Source: World Bank and ZRA staff calculations based on CIT database

Table 5. Share of formal labor by ISIC 1-digit sector (PAYE database)

| **ISIC 1-digit sector** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** |
|---|---|---|---|---|---|---|---|---|---|

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Agriculture, forestry and fishing** | 12.6% | 12.1% | 11.1% | 12.6% | 12.4% | 12.6% | 12.0% | 13.0% | 12.8% |
| **Mining and quarrying** | 16.5% | 15.2% | 12.5% | 11.4% | 11.0% | 10.8% | 9.9% | 9.3% | 9.8% |
| **Manufacturing** | 11.8% | 11.1% | 10.4% | 9.7% | 9.7% | 9.9% | 9.9% | 10.5% | 11.1% |
| **Electricity, gas, steam and air conditioning supply** | 1.9% | 1.9% | 2.0% | 3.3% | 3.1% | 2.3% | 2.2% | 1.7% | 1.8% |
| **Water supply; sewerage, waste management and remediation** | 0.8% | 0.8% | 0.9% | 0.9% | 0.8% | 0.8% | 0.7% | 0.7% | 0.7% |
| **Construction** | 3.0% | 3.3% | 3.0% | 3.6% | 5.1% | 5.7% | 4.5% | 4.1% | 3.6% |
| **Trade and repair of motor vehicles and motorcycles** | 0.9% | 0.9% | 0.9% | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% | 0.8% |
| **Wholesale trade** | 1.8% | 1.8% | 1.9% | 2.0% | 2.3% | 2.6% | 3.1% | 3.3% | 3.7% |
| **Retail trade** | 13.8% | 15.1% | 16.7% | 15.8% | 15.0% | 14.6% | 14.0% | 13.9% | 13.7% |
| **Transportation and storage** | 3.8% | 3.9% | 3.6% | 3.4% | 3.5% | 3.8% | 4.5% | 4.6% | 4.7% |
| **Accommodation and food service** | 2.0% | 2.1% | 2.5% | 2.4% | 2.6% | 2.6% | 2.6% | 2.6% | 2.6% |
| **Information and communication** | 1.5% | 1.3% | 1.3% | 1.1% | 1.0% | 1.0% | 1.0% | 1.2% | 1.0% |
| **Financial and insurance activities** | 3.5% | 3.7% | 3.9% | 3.4% | 3.1% | 3.1% | 3.0% | 2.9% | 3.1% |
| **Real estate activities** | 0.8% | 0.8% | 0.9% | 0.7% | 0.6% | 0.6% | 0.6% | 0.6% | 0.6% |
| **Professional, scientific and technical activities** | 5.0% | 4.8% | 4.4% | 4.3% | 4.5% | 4.2% | 4.4% | 4.1% | 4.1% |
| **Administrative and support service activities** | 6.8% | 6.6% | 7.1% | 8.8% | 8.4% | 8.2% | 7.7% | 7.7% | 7.7% |
| **Public administration and defence; compulsory social security** | 5.4% | 5.4% | 6.2% | 5.3% | 5.4% | 5.3% | 6.4% | 6.2% | 5.7% |
| **Education** | 3.0% | 3.2% | 3.6% | 3.4% | 3.5% | 3.4% | 3.7% | 3.5% | 3.6% |
| **Human health and social work** | 0.9% | 1.0% | 1.1% | 1.1% | 1.1% | 1.2% | 1.5% | 1.6% | 1.7% |
| **Arts, entertainment and recreation** | 0.6% | 0.5% | 0.6% | 0.5% | 0.5% | 0.6% | 0.6% | 0.7% | 0.8% |
| **Other service activities** | 3.7% | 4.3% | 5.1% | 5.5% | 5.7% | 6.0% | 6.9% | 6.9% | 6.4% |
| **Activities of households** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

Note: Trade and repair of motor vehicles and motorcycles, wholesale trade, and retail trade split out at ISIC 2-digit level given divergent trends among the large number of firms within the broader 1-digit sector.
Source: World Bank and ZRA staff calculations based on CIT database

Table 6. Average real wage by ISIC 1-digit sector (PAYE database, thousand constant 2010 ZMK)

| ISIC 1-digit sector | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|
| **Agriculture, forestry and fishing** | 16.93 | 16.75 | 16.60 | 15.27 | 15.31 | 15.25 | 15.39 | 13.91 | 17.52 |
| **Mining and quarrying** | 146.58 | 146.25 | 131.54 | 130.34 | 125.61 | 102.25 | 96.03 | 87.46 | 79.79 |
| **Manufacturing** | 40.56 | 41.77 | 41.20 | 51.42 | 37.21 | 37.31 | 33.81 | 28.15 | 25.30 |
| **Electricity, gas, steam and air conditioning supply** | 160.76 | 162.48 | 138.54 | 86.84 | 85.69 | 100.78 | 92.05 | 86.31 | 84.38 |
| **Water supply; sewerage, waste management and remediation** | 53.88 | 53.64 | 49.38 | 45.53 | 48.67 | 48.03 | 50.67 | 42.92 | 41.86 |
| **Construction** | 47.58 | 49.85 | 55.51 | 40.04 | 34.93 | 35.64 | 46.74 | 42.13 | 25.67 |
| **Trade and repair of motor vehicles and motorcycles** | 49.23 | 47.80 | 46.96 | 44.29 | 42.67 | 40.31 | 35.78 | 32.32 | 29.67 |
| **Wholesale trade** | 192.32 | 153.64 | 124.88 | 107.98 | 68.94 | 65.90 | 83.91 | 34.61 | 31.83 |
| **Retail trade** | 36.33 | 34.64 | 31.93 | 29.23 | 30.51 | 31.40 | 39.39 | 30.41 | 27.39 |
| **Transportation and storage** | 57.48 | 57.11 | 59.67 | 59.28 | 60.78 | 58.15 | 45.90 | 39.54 | 35.43 |
| **Accommodation and food service** | 37.42 | 40.20 | 42.92 | 39.33 | 36.93 | 33.51 | 44.26 | 24.06 | 22.89 |
| **Information and communication** | 106.94 | 107.56 | 97.63 | 96.18 | 89.02 | 88.12 | 72.37 | 58.21 | 68.57 |
| **Financial and insurance activities** | 123.82 | 124.23 | 113.52 | 118.66 | 126.72 | 122.97 | 118.63 | 108.78 | 102.30 |
| **Real estate activities** | 75.30 | 86.60 | 87.93 | 68.33 | 61.89 | 63.16 | 69.33 | 50.29 | 37.83 |
| **Professional, scientific and technical activities** | 62.64 | 59.82 | 55.87 | 48.24 | 68.93 | 57.87 | 61.44 | 48.51 | 42.44 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Administrative and support service activities** | 56.40 | 56.57 | 51.67 | 40.67 | 39.47 | 40.93 | 40.24 | 33.37 | 30.46 |
| **Public administration and defence; compulsory social security** | 104.71 | 97.34 | 88.05 | 173.36 | 87.38 | 80.40 | 83.30 | 59.61 | 42.10 |
| **Education** | 83.64 | 80.70 | 75.33 | 76.58 | 115.47 | 69.95 | 63.02 | 50.91 | 54.93 |
| **Human health and social work** | 65.40 | 66.97 | 65.33 | 66.98 | 74.22 | 60.02 | 54.69 | 48.65 | 42.96 |
| **Arts, entertainment and recreation** | 34.69 | 37.35 | 31.31 | 29.47 | 31.68 | 36.20 | 25.31 | 20.14 | 21.33 |
| **Other service activities** | 76.08 | 60.84 | 59.79 | 49.39 | 46.64 | 47.14 | 56.64 | 41.34 | 37.57 |
| **Activities of households** | 21.19 | 15.35 | 14.78 | 13.00 | 11.47 | 10.18 | 20.53 | 12.08 | 13.27 |

Note: Trade and repair of motor vehicles and motorcycles, wholesale trade, and retail trade split out at ISIC 2-digit level given divergent trends among the large number of firms within the broader 1-digit sector.
Source: World Bank and ZRA staff calculations based on CIT database