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The Returns to Malaysian Labour - Part II

Wage gaps within and between subgroups from 2010 to 2019

Nithiyananthan Muthusamy, Mohd Amirul Rafiq Abu Rahim and Jarud Romadan Khalidi

Khazanah Research Institute

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This working paper was authored by Nithiyananthan Muthusamy, Mohd Amirul Rafiq Abu Rahim and Jarud Romadan Khalidi from the Khazanah Research Institute (KRI). The authors are grateful for the insightful review and comments from Allen Ng (ASEAN+3 Macroeconomic Research Office) and Dr Suraya Ismail (KRI).

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Authors' E-Mail Addresses: **nithiya.muthusamy@krinstitute.org**, **amirul.rahim@krinstitute.org** and **jarud.khalidi@krinstitute.org**

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Summary

- Part I's results on wage growth and wage inequality from 1995 to 2019 emphasized the importance of institutional measures such as the minimum wage in counteracting the structural challenges of the Malaysian labour market. Part II shifts attention to the differential wage experiences of subgroups that compose the labour market.

- Part II's objectives are to (i) assess wage inequality trends *within* subgroups, and (ii) assess wage differentials *between* subgroups. The subgroups in question belong to five dimensions of heterogeneity (education, age, sector, gender and citizenship), and the analyses cover the study period 2010 to 2019.

- We use Salaries and Wages Survey microdata from the Department of Statistics Malaysia to conduct this study. Our methods are divided into *within* and *between* sections for each dimension of heterogeneity. We generate and assess trends in decile ratios (relative inequality) and the interquartile range (absolute inequality) for assessing wage inequality *within* subgroups. We use variations of the Mincerian earnings function to identify levels and changes in wage differentials *between* subgroups.

- Our key findings, by dimension of heterogeneity, are as follows:
  - Education
    - The tertiary education group experienced significant increases in relative and absolute inequality.
    - The tertiary education wage premium, compared to secondary education, declined by between 7 to 10.5 percentage points during the study period.
  - Age
    - Workers within the older age group (55-64 years) experienced the greatest declines in relative inequality, but the greatest increase in absolute inequality.
    - The estimated age of the highest earning worker, other factors held constant, increased from 49 years in 2010 to 63 years in 2019.
  - Sector
    - Manufacturing is the only sector to have experienced a decline in absolute inequality. When statistical controls are applied, manufacturing's average wage drops below agriculture to become one of the most poorly remunerative sectors.
    - The middle of the wage distribution (quintile 3) became more dependent on manufacturing during the study period, potentially providing a link between Malaysia's premature deindustrialization and the struggles of middle earners.

        - Social services (public admin, defence, health, education) rises above modern services to become the second-best remunerative sector after statistical controls are applied.
    - Gender
        - Low wage women workers experienced significant improvements in their relative position to high wage women workers during the study period. But the absolute inequality level for women was higher and increased more significantly compared to men.
        - The average wage for women, unadjusted by any statistical controls and including both citizens and non-citizens, was 2.97% less than men in our study period. After applying statistical controls that adjust for a range of occupational and other factors, we find that women were paid 17.8% less than men for the same job.
        - We find no significant correlation between the adjusted gender pay gap at the sectoral level and variables such as the average wage of a sector, or the dependence of a sector on female employees or professionals. The sectors with the lowest pay gap were public sector oriented, which are subject to tightly defined pay bands.
    - Citizenship
        - Non-citizens experienced significant and consistent reductions in relative inequality indicators. Absolute inequality was higher and increased by a greater magnitude for citizens.
        - The average wage level for non-citizens, unadjusted by statistical controls, was ~45% less than citizens. Once statistical controls are applied to account for occupational and other variations between the two groups, non-citizens are on average paid 1% less than citizens for the same job.
        - But there are significant sectoral variations. Lower wage sectors (retail, F&B, construction, manufacturing) depend heavily on foreign workers for less-skilled occupations and pay them 10-20% less than locals for the same job. Higher wage sectors (finance, public administration, ICT etc) hire fewer but skilled foreigners and provide them with significant wage premia over locals.

- The following are some policy implications from the evidence:
    - We need to reassess our approach to higher education to perhaps emphasize skills and capabilities over expensive credentialling.
    - As wage growth is "stretched" over a longer period of an average worker's life, strategies and programs that allow Malaysians to live healthier and more productive older years are necessary.
    - As Malaysia embarks on a reindustrialization drive, the manufacturing sector could become a driver of robust wage and employment growth for middle earners. The social services sector could also greatly benefit middle earners if the public health sector receives the required public investment.
    - Expanding paternity leave provisions and ensuring access to affordable childcare could help reduce potential work disruptions faced by women due to unequal burdens of care. Centralised wage-setting mechanisms, which define pay bands for occupations by skills and experience, could help reduce the gender pay gap and mitigate the wage suppression effects of unregulated foreign labour in critical sectors.
    - In general, groups significantly affected by the minimum wage exhibited greater reductions in relative inequality.

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1. Introduction

This working paper is the second and final part of our review of wage growth and inequality for the decades preceding the COVID-19 pandemic. The first part used a combination of Household Income and Expenditure Survey (HIES) and Salaries and Wages Survey (SWS) data to review wage trends and assess their underlying causes over a 24-year period (1995-2019). We found that our labour market, in the absence of significant intervention, is structurally geared towards a suppressed and broadly regressive wage growth pattern.

Interventions such as the minimum wage have been crucial towards mitigating this pattern in the 2010-2019 decade, but we nevertheless observe wage stagnation in ringgit terms for the bottom half of Malaysian workers despite the minimum wage. The policy journey towards ensuring robust and equitable wage growth is clearly not over, and the minimum wage must be complemented with additional institutional measures to achieve the vision of a well-functioning labour market.

Towards that end, our review of wages now shifts towards assessing the experiences of heterogenous subgroups during the 2010-2019 period. We are unable to undertake analyses extending before this period due to data limitations; our socio-demographic variables are the most complete and representative for the SWS data which covers the 2010 to 2019 timeframe. The SWS data is also available on an annual basis during this timeframe, thereby allowing for year-to-year observations of subgroup trends.

The dimensions of heterogeneity that are addressed in this study include education, age, sector, gender and citizenship. We are aware that these are non-exhaustive, but we are limited by our data and have exercised our judgement in scoping our study towards the most policy-relevant directions. We are also cognisant of the myriad subgroup combinations that we will be unable to address in the limited space of this working paper. Our goal to is to advance the frontier of understanding to glean policy lessons, and to thereby motivate further in-depth work by other researchers.

Part II is organized as follows. We begin with a review of datasets and variables; this was also undertaken in Part I and we present here a summary of the SWS dataset. We then enumerate our research objectives and elaborate the methods that correspond to those objectives. This is followed by the results and discussion section; we include a discussion section for each dimension of heterogeneity instead of combining them in an omnibus fashion in the hope of improved readability and enhanced visibility of policy lessons. We then review, connect and summarize our findings and recommendations in the conclusion section.

As always, the authors welcome feedback.

2. Data and Variables

We analyse data from the Salaries and Wages Survey (SWS) to fulfil the research objectives of this working paper. Table 1 below provides a summary of the SWS dataset we received from the Department of Statistics Malaysia (DOSM).

Table 1: Summary of Salaries and Wages Survey data

Dataset	Granularity Level	Nationality	Survey Years	Income Variables	Other Variables
Salaries and Wages Survey (SWS)	Individual	Malaysian citizens and non-citizens	2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020	Total salaries & wages received, exclude overtime payment Total salaries & wages received, include overtime payment	State Strata (urban/rural) Sex (male/female) Age Citizenship Highest education Occupation (classified according to 2 digits MASCO 1998) Industry (classified according to 2 digits MSIC 2008)

The SWS is part of the annual Labour Force Survey (LFS) which was initiated in 2010[1]. All SWS data was received at the individual worker level, and covers both Malaysian citizens and non-citizens. Our analyses are primarily concerned with labour income before the effects of taxes and transfers, therefore our chosen income variable is total salaries & wages including overtime payment. Unless otherwise stated, all wages are expressed in real (2021 ringgit) terms to account for inflation. Appendix 1 provides the components of salaries and wages as defined by the SWS questionnaire.

Our data cleaning procedures included consistency checks and the relabelling or recoding of variables to ensure comparability across survey years. Unlike Part I, we utilise the full dataset, and do not trim the bottom and top three percent of observations. We adopt this approach for two reasons. First, the SWS data is generally cleaner and more stable across survey rounds than the HIS. The HIS data covers a longer timeframe at infrequent intervals and captures many aspects of household wellbeing, whereas the SWS is conducted yearly and is exclusively focused on wages. Second, specific subgroups are more heavily represented at the extreme ends of the

[1] The SWS provides yearly statistics on wages and salaries with a consistent approach for comparable time series statistics. It collects wages and salaries for the main job among employed respondents of a household aged 15 – 64 in the public or private sector. It is also important to note that the SWS sample excludes employers, self-employed persons, unpaid family workers, domestic personnel of household as employers, temporary workers (including apprentices who receive allowances, volunteers) and part-time workers (including casual workers on a daily basis with uncertain working hours and income). The SWS produces statistics at national, state and urban/rural levels, and does not include residential institutions such as hostels, hotels, hospitals, old folks' homes, prisons and welfare homes.

wage spectrum, and we risk losing important information by dropping these observations. The analysis in Part I was primarily concerned with the evolution of wage levels across the distribution without differentiation along socio-economic or socio-demographic lines. Part II is particularly concerned with these dimensions of heterogeneity, and so retaining these extreme observations adds value to our analyses and the resulting narrative.

Table 2 below presents the total number of observations across survey years after cleaning.

Table 2: Sample size of SWS dataset

Individuals from SWS	
Year	Sample size
2010	52,073
2011	54,977
2012	54,214
2013	51,676
2014	52,720
2015	51,856
2016	47,630
2017	92,665
2018	93,564
2019	98,768
2020	98,758
Total	748,901

While we received data for 2020, we confine our timescale of inquiry to the 2010-2019 period in order to exclude the shock of the COVID-19 pandemic. The pandemic imposed acute and time-bound constraints on the labour market for a couple of years beginning 2020, and so the inclusion of 2020 would risk conflating structural trends with the prominence of a concentrated shock.

3. Objectives and Methodology

The research objectives for Part II of this working paper series are as follows:

1. Assessing wage inequality trends *within* subgroups across five dimensions of heterogeneity (education, age, sector, gender and citizenship)
2. Assessing wage differentials *between* subgroups across five dimensions of heterogeneity (education, age, sector, gender and citizenship)

Note that there is much less emphasis on wage *growth* here compared to Part I. Wage growth is substantially analysed and elaborated upon in Part I, hence the emphasis in Part II shifts towards the inequalities and differentials between and within the subgroups that compose the Malaysian labour market. Table 3 below enumerates the subgroups within each dimension of heterogeneity that are addressed in this study.

Table 3: Dimensions of heterogeneity and subgroups

Dimension of Heterogeneity	Subgroups
Education	No formal education/ Primary education (*Refers to persons who never attended school in any of the educational institutions that provide formal education. Primary education refers to those whose highest level of education attained is from Year 1 to 6 or equivalent*) Secondary (*Refers to those whose highest level of education attained is from Form 1 to 5 (including remove class), General Certificate of Education 'O' Level or equivalent. Includes basic skills programmes in specific trades and technical skills institutions where the training period is at least six months e.g. GIATMARA*) Tertiary (*Refers to those whose highest level of education is above Form 5*)
Age	15-24 25-54 55-64
Sector	Agriculture, Forestry and Fisheries Mining and Quarrying Manufacturing Construction Modern Services (*Information & Communication* | *Financial and Insurance/Takaful Activities* | *Real Estate Activities* | *Professional, Scientific and Technical Activities*) Utilities (*Electricity* | *Gas* | *Steam and Air Conditioning Supply* | *Water Supply* | *Sewage Waste Management and Remediation Activities*) Social Services (*Public Administration and Defence* | *Compulsory Social Security* | *Education* | *Human Health and Social Work Activities*) Other Traditional Services (*Wholesale and Retail Trade* | *Repair of Motor Vehicles and Motorcycles* | *Transportation and Storage* | *Accommodation and Food Service Activities* | *Administrative and Support Service Activities* | *Arts, Entertainment and Recreation* | *Other Service Activities*) Activities of Extraterritorial Organisations and Bodies
Gender	Male Female
Citizenship	Citizen Non-citizen

We combine those who have completed primary education and those without formal education into one group when addressing educational heterogeneities due to "no formal education" comprising only 2.1% of all observations. The age categories are defined according to the common norm of dividing the labour force into young (15-24 years), prime age (25-54 years) and older (55-64 years) workers.

In our analysis of sectoral trends and differentials, we adopt categorisations that are broadly consistent with those used in policy and research documents, except for services. Service categories are typically divided into two buckets; modern and traditional. But our scrutiny of the wage data (see Appendix 2 for listing of average wage levels according to 2-digit industry codes) indicate that this rudimentary division may be inadequate to represent sectoral heterogeneity. Human health and social work activities, for example, is often classified under "traditional services" and lumped together with low-paying industries such as accommodation and retail. But

its average wage level is much higher than many other industries, and a sizable share of its activities could be reasonably categorised as highly-skilled.

We thus create two additional sector categories that draw from industries conventionally placed under "traditional services": (i) Utilities which covers Electricity, Gas, Steam and Air Conditioning Supply, Water Supply, Sewage Waste Management and Remediation Activities, and (ii) Social Services which includes Public Administration and Defence, Compulsory Social Security, Education, Human Health and Social Work Activities.

Table 4: Unit of analysis

Unit of Analysis	Time Period	Dataset
Wage-earning worker	2010 – 2019	Salary and Wages Survey (SWS)

Our unit of analysis in Part II is the wage-earning worker for the period 2010-2019. The analytical methods we adopt are targeted towards understanding the effects of "within group" and "between group" factors on the wage earnings of a Malaysian worker.

3.1. Within Group Methodology

In Part I, we compute, tabulate and discuss several relative and absolute inequality indicators for households and workers across the wage distribution. In Part II, a parsimonious approach is required due to the larger study scope, namely the large number of groups for which inequality trends are to be generated and scrutinized.

Therefore, in our treatment of within group inequalities, the analysis is limited to the percentage change in decile ratios for identifying relative inequality trends, and the level and absolute change in the interquartile range for observing absolute inequality patterns. We do this for two reasons. First, the decile ratios were the primary indicators of relative inequality in Part I, thereby maintaining consistency and comparability between the two parts. Second, both approaches are grounded in a percentile-based approach to assessing inequality, as opposed to approaches that are premised on income shares (Gini, Palma, standard deviation etc). These choices do not discount the value of share-based indicators and indices and the additional information they provide[2], but we do not have scope here to meaningfully address them and we hope other researchers will harness their analytical and policy potential in future publications.

Table 5: Relative and absolute inequality indicators

Relative Inequality Indicators	Absolute Inequality Indicator
Percentage change in decile ratios of the real wage distribution • D9/D1 (headline inequality) • D9/D5 (top-end inequality) • D5/D1 (low-end inequality)	Level and absolute change in the interquartile range (IQR) IQR = difference between 75th and 25th percentiles of the real wage distribution

[2] Piketty and Saez (2003), Piketty (2013)

As indicated in Part I, decile ratios provide a relative sense of the gap between different positions along the wage distribution, and the three positions we employ are the 10th percentile (1st decile), the 50th percentile (5th decile or median), and the 90th percentile (9th decile). The interquartile range (IQR) is the ringgit difference between the wage levels at the 75th and 25th percentiles of the real wage distribution. It provides a measure of the absolute spread of the middle of the wage distribution. We include the evolution of the decile ratios and the interquartile range of the overall labour market from Part I as a reference group while assessing changes for subgroups. The decile ratios and IQR values for our within group analyses are in Appendix 3.

3.2. Between Group Methodology

The manner in which labour markets differentially absorb and reward labour according to socio-demographic and socio-economic characteristics is an area of active research and policy deliberation. The workhorse model in the literature for quantitatively measuring between group wage differentials is the Mincerian earnings function. The strengths and limitations of the Mincerian model is an area of active debate[3], but we adopt it in this study due to its ability to add analytical complexity to existing empirics on the labour market while remaining grounded in a relatively simple conceptual framework.

$$\ln y = \alpha + \beta_1(education) + \beta_2(age) + \beta_3(age^2) + \sum_{i=1}^{n} \beta_i(sub\ groups_i) + \sum_{j=1}^{k} \beta_j(controls_j) + \varepsilon \quad \textbf{(1)}$$

y = real wage

education = categorical dummy variables indicating highest educational attainment per Table 3

age = continuous variable

sub groups = sub groups listed in Table 3

controls = strata dummy (urban/rural), occupation dummies (elementary occupations/plant & machine operators & assembly/craft & related trade workers/skilled agricultural, forestry and fish/service and sales workers/clerical support workers/technician and associate professionals/professionals/managers), state dummies, year dummies

β = regression coefficients

[3] Heckman et al. (2003), Lemieux (2003)

α = intercept

ε = error term

Equation (1) above presents our full original least squares (OLS) specification of the Mincerian earnings function. The dependent variable is the natural logged value of our real wage variable. The function posits a linear relationship with educational qualifications or skills levels, and a quadratic relationship with age or experience. Some studies include separate variables for experience and skills, but we haven't the data. Skills are controlled for to some extent with our occupation dummies.

The subgroups listed in Table 3 are added to the function as categorical variables. When assessing heterogeneities for education, age, gender and citizenship, the sector categories are used in their original 2-digit MSIC form. But we use the eight consolidated categories in Table 3 when focusing on sectoral wage differentials. The full specification is run for our pooled dataset (including all observations in the 2010-2019 period) and for each year. SWS survey weights are applied. These regression results are available in Appendix 4.

Education

It is often assumed that the attainment of tertiary education credentials leads to improved wage outcomes. While this holds true for Malaysia as it does in many other countries, we've yet to observe how much an average Malaysian worker would gain in average earnings through the attainment of tertiary education qualifications relative to secondary qualifications, after controlling for a range of geographic, demographic and socio-economic factors. We've also yet to observe how this wage premium evolves over time.

The results from the full specification of equation (1), pooled and annual, are used to provide the wage premium (percentage improvement in average earnings) for tertiary education relative to secondary education. The secondary education category is the reference group due to it comprising most of the Malaysian labour force (55% of all observations), and the attainment of tertiary education is therefore perceived as an additional investment of time and money over this baseline scenario.

We run three additional variations of the Mincerian function which respectively exclude industry, occupation, and industry & occupation (see Appendix 5 for results). Our purpose is to assess the consistency of wage premium trends after dropping variables that may be reasonably considered as channels by which education credentials translate to wage outcomes. For example, occupational categories such as professionals and managers are mostly composed of tertiary-educated workers. Similarly, sectors such as education have a high concentration of tertiary-educated employees. The theory of change is that tertiary credentials lead to employment in occupations or sectors that improve wage outcomes, and so controlling for occupation and sector may mechanically, and erroneously, hold constant necessary variations in channels of change.

Table 6: Correlation coefficient matrix

	age	sex	state	strata	edu	occ	industry
age	1						
sex	-0.0469	1					
state	-0.0166	0.0097	1				
strata	-0.0283	-0.0504	-0.0251	1			
edu	-0.1263	0.1658	0.0052	-0.1477	1		
occ	-0.0428	-0.2447	-0.0557	0.1778	-0.5753	1	
industry	0.0976	0.1913	0.075	-0.1396	0.3282	-0.3884	1

Table 6 above presents the correlation coefficient matrix for the independent variables in our regression. Note that the three largest absolute values are for education-occupation (0.56), occupation-industry (0.39), and education-industry (0.33). These three variables are clearly clustered in their interrelationships, but the coefficient values are below thresholds of concern for multicollinearity. Nevertheless, we run the three additional regression variations as robustness checks of the wage premium trend over time.

Age

The Mincerian function provides the opportunity to assess the wage differential between age levels after controlling for a range of variables. It thus provides a cross-sectional snapshot of the quadratic wage curve as it relates to age once a worker's geographic, socio-economic and demographic features are held constant.

We use the regression results of the full Mincerian specification for the years 2010, 2013, 2016 and 2019 to assess the evolution of the wage curve (see Appendix 4). We differentiate these equations with respect to age to identify the linear relationship between the rate of change in the wage level and the age level, and then graph the differentiated equations to identify patterns and trends.

Sector

In assessing wage differentials across the eight sector groups (see Table 3) we adopt Agriculture, Forestry and Fisheries as the reference group. Agriculture has the lowest average wage level during our study period (see Appendix 2). We begin by assessing the percentage difference in pooled average wage levels between each sector grouping and agriculture during our study period. These wage differentials are unadjusted by regression analysis, and therefore do not provide a measure of each sector's wage attractiveness from the point of view of a worker with average characteristics and features.

To remedy this deficiency, we run two variations of the Mincerian earnings function (with the consolidated sector groupings in Table 3) using pooled data; one full and the other excluding occupation (see Appendix 6 for results). As noted in Table 6 above, the correlation coefficient between industry and occupation is the second highest (0.39), and so we use a comparison of the

pooled estimates between the full and *sans occupation* variations as a robustness check. The full specification is also run for each year in order to assess yearly changes in sectoral wage differentials (results in Appendix 6).

The "activities of extraterritorial organizations and bodies" industry category is included in all regressions but is excluded in graphs and discussions due to its negligible (0.019% of all observations) position in the labour market.

Gender & Citizenship

Our analytical approach to assessing wage differentials for the gender (Gender Pay Gap – GPG) and citizenship (Citizenship Pay Gap – CPG) subgroups are similar since, at bottom, they attempt to address issues of wage discrimination. We adopt as our core method the Kitagawa-Blinder-Oaxaca[4] decomposition of wage differentials, which has a long history in the literature[5].

For simplicity, we refer here to reference groups A (male or citizen) and target groups B (female or non-citizen) in explaining our methods. We begin by observing the unadjusted pay gap between groups A and B, which is a simple calculation of the percentage difference in average wage levels (see equation 2 below).

$$PG_{unadjusted} = 1 - \frac{\overline{Y}^{B}}{\overline{Y}^{A}} \qquad \textbf{(2)}$$

The unadjusted numbers are a useful high-level comparison of average wage outcomes between groups A and B, but they do not account for the varied ways in which these groups are distributed and segregated in the labour market. Group B (women or foreign labour) may be more concentrated in particular occupations or industries compared to group A (men or citizens), and the high-level average numbers are a result of these compositional variations. In other words, it does not approximate the "equal pay for equal work" standard which emphasizes equal pay at the occupational level holding constant all other factors (education, age etc). Another way of interpreting the difference in average wage levels is to divide them into two parts; one that can be "explained" by observable and measurable differences in the way the two groups are segmented in the labour market, and another that cannot be so explained. We expand upon this approach below and are indebted to two Eurostat working papers[6] on the gender pay gap (GPG) for a systematic delineation.

Let us first observe the full specification of the Mincerian function for groups A and B separately.

[4] Kitagawa (1955), Blinder (1973), Oaxaca (1973)
[5] Fortin et al. (2010)
[6] Leythienne and Ronkowski (2018), Leythienne and Perez-Julian (2021)

$$\overline{\ln y}^{A} = \hat{\alpha}^{A} + \sum \hat{\beta}^{A}\ \overline{x}^{A} \qquad \textbf{(3)}$$

$$\overline{\ln y}^{B} = \hat{\alpha}^{B} + \sum \hat{\beta}^{B}\ \overline{x}^{B} \qquad \textbf{(4)}$$

In equations (3) and (4) above, the x_s are the sub groups and controls, the β_s are the regression coefficients, and the α_s are the intercepts. We can now decompose the difference in average wage levels into unexplained (U) and explained (E) portions, as presented in equation (5) below.

$$\overline{\ln y}^{A} - \overline{\ln y}^{B} = \underbrace{(\hat{\alpha}^{A} - \hat{\alpha}^{B}) + \sum \overline{x}^{B}(\hat{\beta}^{A} - \hat{\beta}^{B})}_{\textbf{(U)}} + \underbrace{\sum \hat{\beta}^{A}(\overline{x}^{A} - \overline{x}^{B})}_{\textbf{(E)}} \qquad \textbf{(5)}$$

The "unexplained" (U) portion is made up of the difference in the intercepts ($\hat{\alpha}^{A} - \hat{\alpha}^{B}$), and the difference in the wage structures $(\hat{\beta}^{A} - \hat{\beta}^{B})$ once the sub group and control characteristics are held constant at the average levels of the target group ($\overline{x}^{B}$). The "explained" (E) portion is composed of the differences in the observable and measurable characteristics of the two groups $(\overline{x}^{A} - \overline{x}^{B})$, once the wage structure is held constant at the levels of the reference group ($\hat{\beta}^{A}$).

We are now provided with an avenue for transforming our unadjusted pay gap ($PG_{unadjusted}$) in equation (2) into an adjusted version that removes the effects of the "explained" portion to leave the "unexplained" part.

$$PG_{adjusted} = 1 - \left(1 - PG_{unadjusted}\right) X\ e^{E} \qquad \textbf{(6)}$$

In equation (6) above we see that the exponent of (E) serves as an adjustment factor on the simple average wage ratio ($\frac{\overline{Y}^{B}}{\overline{Y}^{A}}$) to provide the adjusted pay gap. Appendices 7 and 8 provide the regression results and the average variable values that we use to compute the adjusted pay gaps.

It is important to note here that we do not claim that the adjusted pay gaps represent the "truth", but only that they more closely approximate the "equal pay for equal work" standard than a simple comparison of means. The goal is to enrich our understanding of pay gaps with a more sophisticated treatment of the data and additional indicators, and not to exclude or trivialize the value of existing indicators and methods.

3.3. Limitations

We would not be able to undertake this analysis without access to unit-level data from the Salaries and Wages Survey, and survey data is a core element of some of the most impactful research on labour markets. Nevertheless, there are a couple of limitations to the data that we must spell out here.

First, household surveys are generally weak at capturing incomes at the extreme ends; low incomes because these surveys avoid hostels, dormitories and other facilities in which low wage labour may be concentrated, and high incomes because these households usually have the highest non-response rates and chronically underreport income levels[7]. Second, SWS data excludes specific portions of the wage-earning labour force, such as domestic workers, part-time workers and temporary workers.

We are also cognisant of the lack of data on years of experience, work hours, years of schooling and firms (type, size, number of employees etc), in our analyses. The absence of temporary and part time workers from the SWS dataset may also result in a systematic underrepresentation of certain subgroups in our results. These are data and factors that are often included in the specification of Mincerian functions in other studies, and their availability would have improved the rigour of our findings.

Where we compare the results of specific subgroups in this paper to overall trends in Part I, we do so primarily to assess directional consistency between the two. Comparisons of magnitude are limited as much as possible. This ringfencing of the purpose of Part I's results in Part II's analyses is recognition of the slight difference in the SWS datasets between the two (trimmed vs untrimmed).

Finally, since we lack panel data, we are unable to elaborate on matters related to wage mobility over time or over a worker's career. This is pertinent when reviewing results for the Age subgroups; our Mincerian functions provide a cross-sectional representation of the change in the average wage level across ages once other factors are held constant, and they don't necessarily represent the incremental value of an additional year's worth of work experience.

Notwithstanding the matters above, we are confident that the results in this working paper greatly expand our understanding of the Malaysian labour market, and we invite other researchers to extend and improve upon the methods and narratives seen here.

[7] Milanović (2016)

4. Results

4.1. Education

Within

Figure 1: Percentage change in relative wage inequality ratios, by education, 2010-2019 period

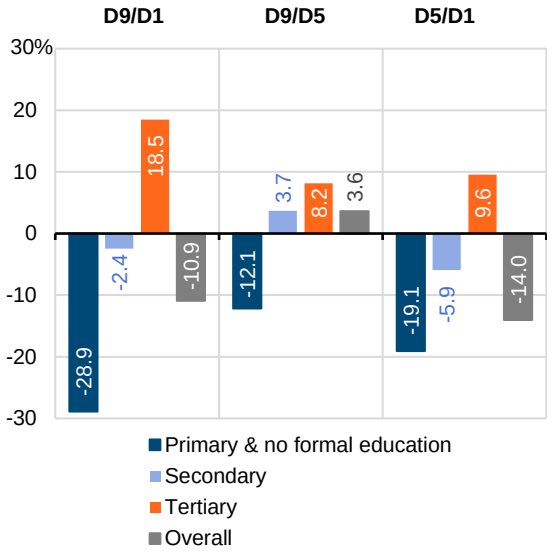
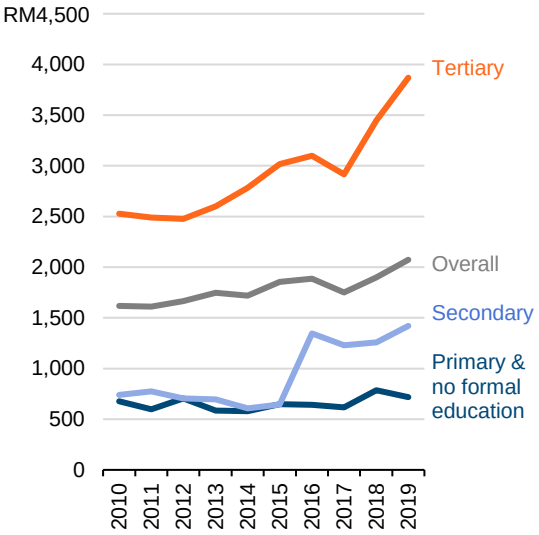


Figure 2: Interquartile range, 2010-2019, by education



Out of the three educational groups, only those having completed a secondary education experienced changes in relative wage inequality that were directionally identical to the overall pattern (see Figure 1 above). That comes as no surprise as this group comprises the majority of the labour force (~55% of all observations during our study period). The primary/no formal and tertiary groups are a study in contrasts. The former experienced significant and consistent reductions in wage inequality across all indicators, while the opposite was true for the latter which experienced significant increases in relative inequality across the board. It is important to note here that the primary/no formal group comprises ~15% of all observations, while the share of the tertiary group is ~30%.

These relative trends are further affirmed by the absolute patterns as observable in Figure 2 on the right. The interquartile range is significantly higher for the tertiary group compared to the overall labour force, and this is consistent with the fact that wage levels for the tertiary group are generally higher than the other groups, thereby allowing for greater levels of absolute dispersion. But the **growth** in absolute inequality (RM 2528 to RM 3869) for the tertiary group outstrips that of the overall group (RM 1619 to RM 2073) by a significant margin. The primary/no formal group experienced little to no change in the absolute inequality, while the secondary group experienced a notable increase of RM 702 from 2015 to 2016.

Between

Figure 3: Tertiary education wage premium relative to secondary education, 2010 – 2019

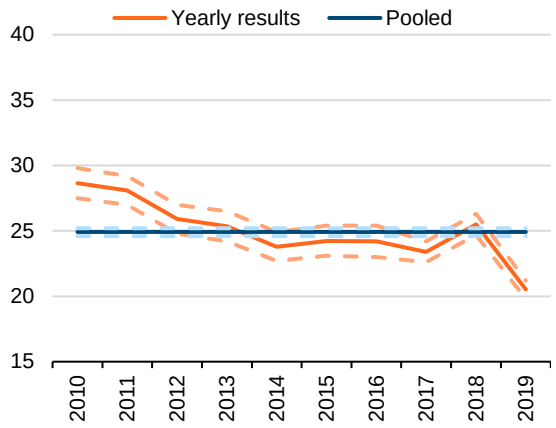


Figure 4: Tertiary education wage premium relative to secondary education (sans Ind), 2010 – 2019

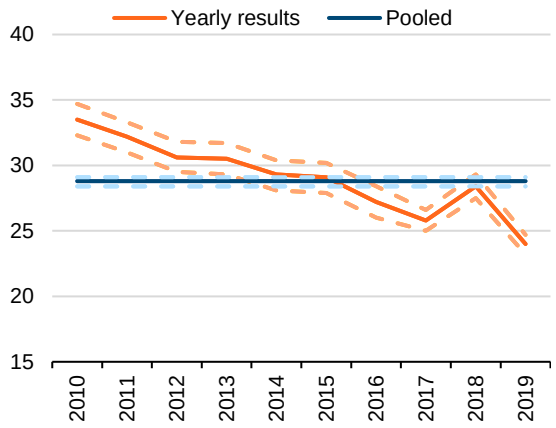
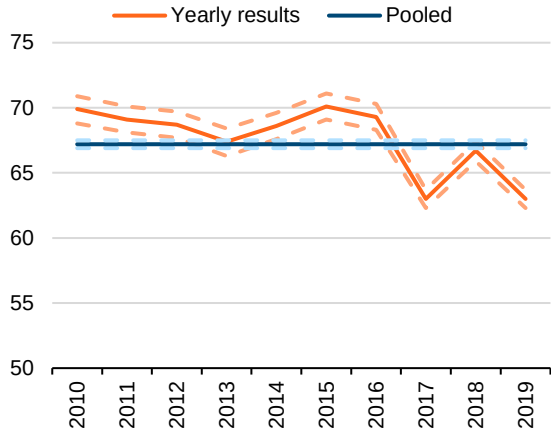


Figure 5: Tertiary education wage premium relative to secondary education (sans Occ), 2010 – 2019

Figure 6: Tertiary education wage premium relative to secondary education (sans Ind & Occ), 2010 – 2019



As indicated in the methodology section, we run four variations of the Mincerian earnings function in order to identify the level and trend of the tertiary education wage premium relative to workers with secondary education credentials. The purpose of these four iterations is to ensure that the observed trends are robust after accounting for the fact that industrial and occupational variables are potential transmission mechanisms for the effect of education on wages. The dotted lines represent the upper and lower bounds of the confidence intervals, while the solid lines represent the pooled and yearly levels of the tertiary education wage premium.

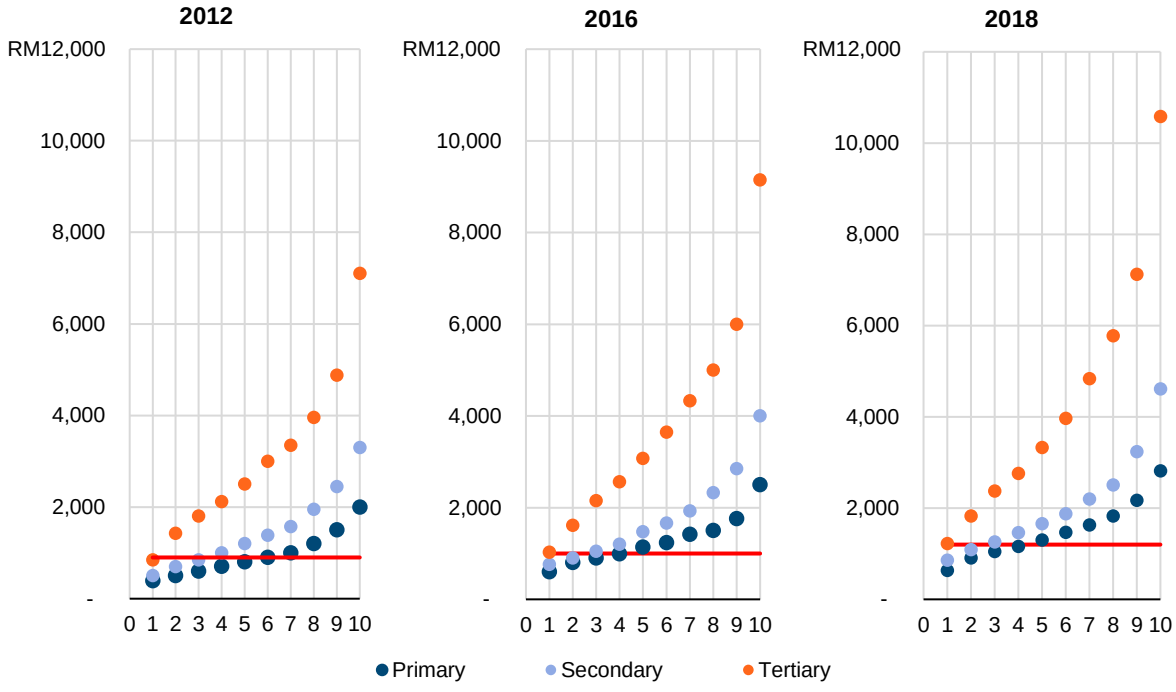
Figure 3 presents the wage premium in percentage terms for tertiary education compared to secondary education from the full specification of the Mincerian earnings function. We see that the pooled tertiary education "effect" on wage earnings across the whole 2010-2019 period is approximately 25% (the horizontal blue line). The orange line presents the yearly results, and there is a clearly discernible declining trend during this period; the wage premium decreases by 8 percentage points from 29% to 21%.

In Figure 4, the results are regenerated after excluding industry and retaining occupation from the earnings function. Figure 5 excludes occupation while retaining industry, and Figure 6 presents results after excluding both industry and occupation. The pooled effect rises in magnitude from Figure 3 to Figure 6 ; this comes as no surprise as industry and occupation are potentially important drivers of wage differentials, and so removing them from the earnings function *explains* less of the wage variations. But the three additional graphs are to assess whether we detect a declining tertiary education premium across all four specifications.

In Figure 4 (excluding industry) and Figure 5 (excluding occupation), a very similar downward trend is observed with reductions in the premium of 9.5 and 10.5 percentage points respectively. Figure 6 (excluding industry and occupation) demonstrates a slightly different trend, but nevertheless indicates a declining premium; the premium fluctuates within the 67 to 70 percent range from 2010 to 2016, and then declines to 63% in 2019, which is a 7 percentage point decrease over the whole period. The evidence indicates that the wage premium enjoyed by workers with tertiary education credentials compared to those with secondary credentials declined by a magnitude between 7 to 10.5 percentage points from 2010 to 2019.

Discussion

Figure 7: Median nominal wage levels by education and decile, for 2012, 2016 and 2018



A potential explanatory factor for the within-group relative inequality trends is the minimum wage, and how it differentially affects each education group. Figure 7 above provides the median nominal wage levels for each education group by decile for the years 2012, 2016 and 2018. The horizontal red lines are the minimum wage levels implemented in those years (RM900, RM1000 and RM1200 respectively).

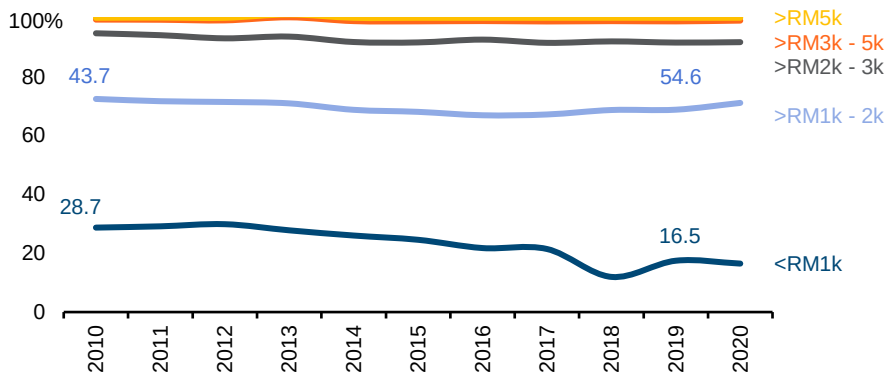
In 2012, wages up until the 6th decile were affected by the minimum wage for the primary/no formal education group, while the same is true for wages up until the 3rd or 4th deciles for the secondary education group. The tertiary education group is the least affected, with only the first decile affected by the minimum wage. A similar pattern is observed for 2016 and 2018, whereby the bottom 30 to 40% of the wage distribution for the primary/no formal and secondary groups are affected by the minimum wage, and the tertiary group is relatively unaffected.

As indicated in the "within" section above, the primary/no formal and secondary groups experienced the greatest improvements in the relative positions of low wage workers (reductions in D9/D1 and D5/D1 ratios), and the minimum wage could be an explanatory factor based on the data above. The magnitude of relative inequality reduction is greatest for the primary/no formal group, and this could be explained by the lower levels of nominal income for this group within the minimum wage impact deciles, thereby translating to a greater percentage impact in relative terms.

The significant wage premium enjoyed by tertiary educated workers is consistent with global evidence on college graduates and skilled workers enjoying better wage outcomes[8]. But trend lines are important, and, in addition to the "between" results above for Malaysia, other outside evidence indicating stagnating or reduced premia[9] has energised the question of whether continued investments in tertiary credentialling translate to better economic outcomes.

At the local level, we've several labour market indicators that demonstrate underwhelming outcomes for our graduates. KRI's recent working paper titled "Fresh Graduate Adversities: A Decade's Insight on the Graduate Tracer Study"[10] found that more than half of all working graduates earn less than RM2000 soon after graduation (see Figure 8).

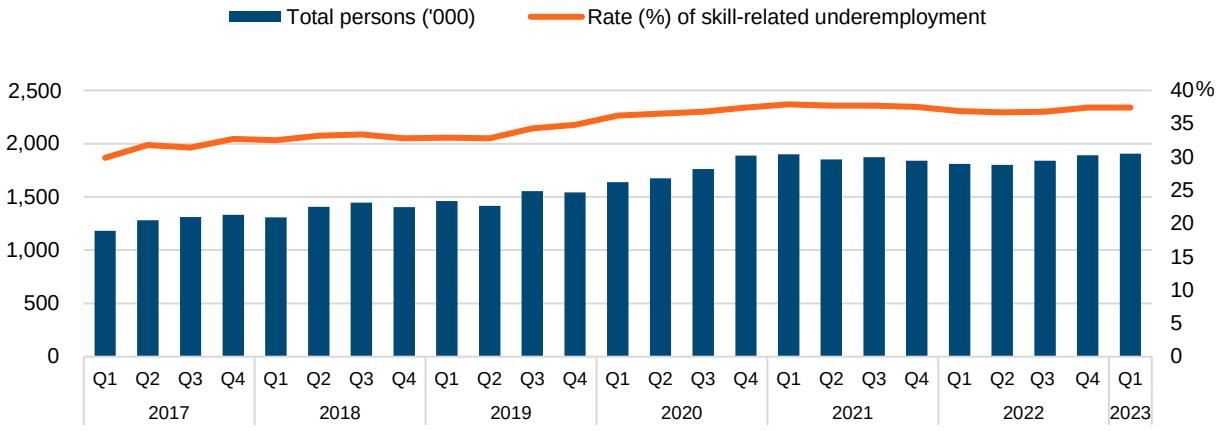
Figure 8: Percentage of working graduates, by monthly income range, 2010-2020



Source: MOHE (various years)

[8] Autor et al. (2008); Autor (2015); Azam (2009); Deming (2022); Walker and Zhu (2005); Velden and Bijlsma (2016); Strauss and Maisonneuve (2009)
[9] Howell and Kalleberg (2022); James (2012); Walker and Zhu (2005); Juhn et al. (1993)
[10] Mohd Amirul Rafiq Abu Rahim and Shazrul Ariff Suhaimi (2022)

Figure 9: Skills-related underemployment among graduates, percentage and total persons, 2017-2023



These poor wage outcomes are perhaps partly explained by high and rising levels of skills-related underemployment among graduates, rising from 29.9% in the first quarter of 2017 to 37.4% in the first quarter of 2023 (see Figure 9 above). Tertiary educated young workers are unable to find employment that is commensurate to their years of schooling and investment in educational credentials.

An additional signal of this lack of employment opportunities is the dramatic rise in self-employment among fresh graduates from 3% in 2010 to 20% in 2020. Lest we confuse this trend with rising entrepreneurialism, more than half of these graduates want to change their profession (away from self-employment) and many are actively seeking stable full-time employment[11].

[11] Ibid.

4.2. Age

Within

Figure 10: Percentage change in relative wage inequality ratios, by age group, 2010-2019 period

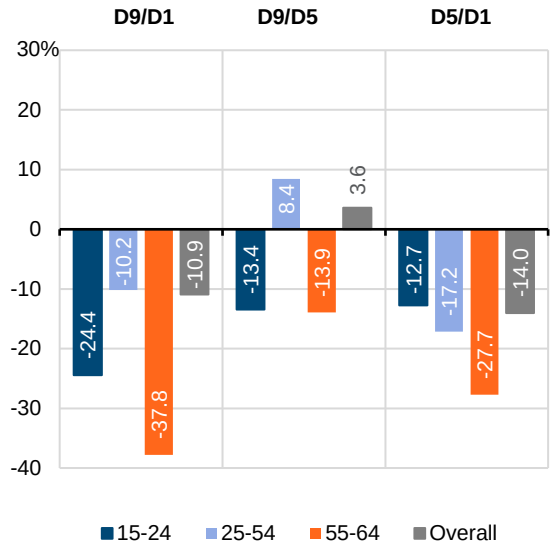


Figure 11: Interquartile range, 2010-2019, by age group

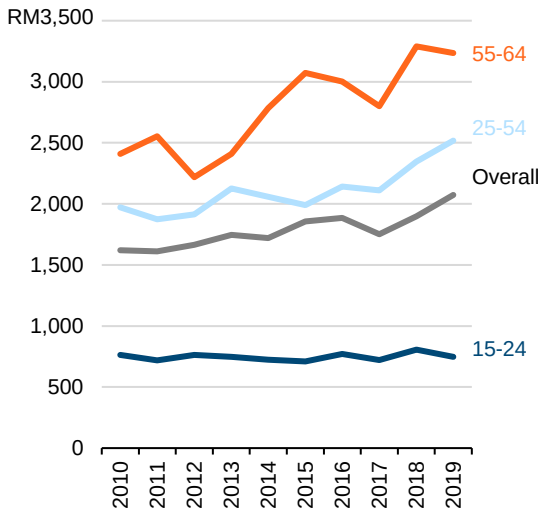


Figure 10 on the left presents the percentage changes for the three relative inequality ratios across age groups during our study period. Older workers (55-64 years) experienced the most pronounced compression in relative terms with large declines in headline (-37.8%), top-end (-13.9%) and low-end (-27.7%) inequality. Relative inequality for workers in their prime years (25-54 years) evolved consistently with the overall trend, which is unsurprising since approximately 77% of all observations in our dataset are from this age group. Young workers (15-24 years) also experienced significant reductions in all three relative inequality ratios but with lesser magnitudes when compared to older workers.

Figure 11 on the right demonstrates the evolution of the interquartile range (IQR) for the three age groups. Older workers possess a higher level of absolute wage dispersion compared to prime age, overall and young groups; the IQR for older workers was RM 789 higher than the overall group at the beginning of the period, and this difference increased to RM 1162 by the end. Older workers also experienced the greatest increase in absolute inequality (RM 826 increase in IQR) compared to the prime age group (+RM547). Young workers experienced a decline in absolute inequality (-RM15) during this period.

Between

Figure 12: Incremental change in real wage across age levels, 2010, 2013, 2016, 2019

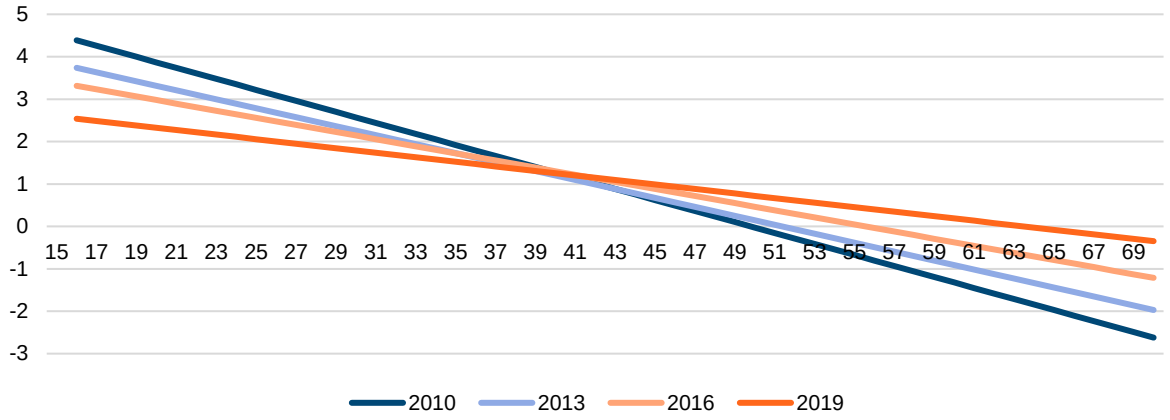


Figure 12 above presents the percentage difference in the real wage between age levels from the full Mincerian specification for the years 2010, 2013, 2016 and 2019. To remind our readers, the regression specification posits a quadratic relationship between earnings and age (i.e. the wage level increases at a decreasing rate as the age level increases), and the visualization above is a result of differentiating the regression results with regard to age in order to plot the declining rate of increase.

While the estimated lines cross into negative territory at higher age levels, it would be erroneous to view this as evidence of significant wage declines at older ages, as this is but an artefact of the fitting method that produces these lines. The better approach is to interpret the intercept at the x-axis (horizontal age axis) as the estimated age of the worker with the highest wage level once other factors are held constant.

What we observe is an elegant reduction in steepness during our study period, with the fulcrum of rotation at approximately the 40-year point. The results indicate a gradual reduction in the wage differential between age levels below the 40-year threshold, and a steady increase in the differential above this threshold. The wage maximization point (intercept at the x-axis) increases steadily from 49 years in 2010 to 63 years in 2019.

Discussion

Figure 13: Median nominal wage levels by age group and decile, for 2012, 2016 and 2018

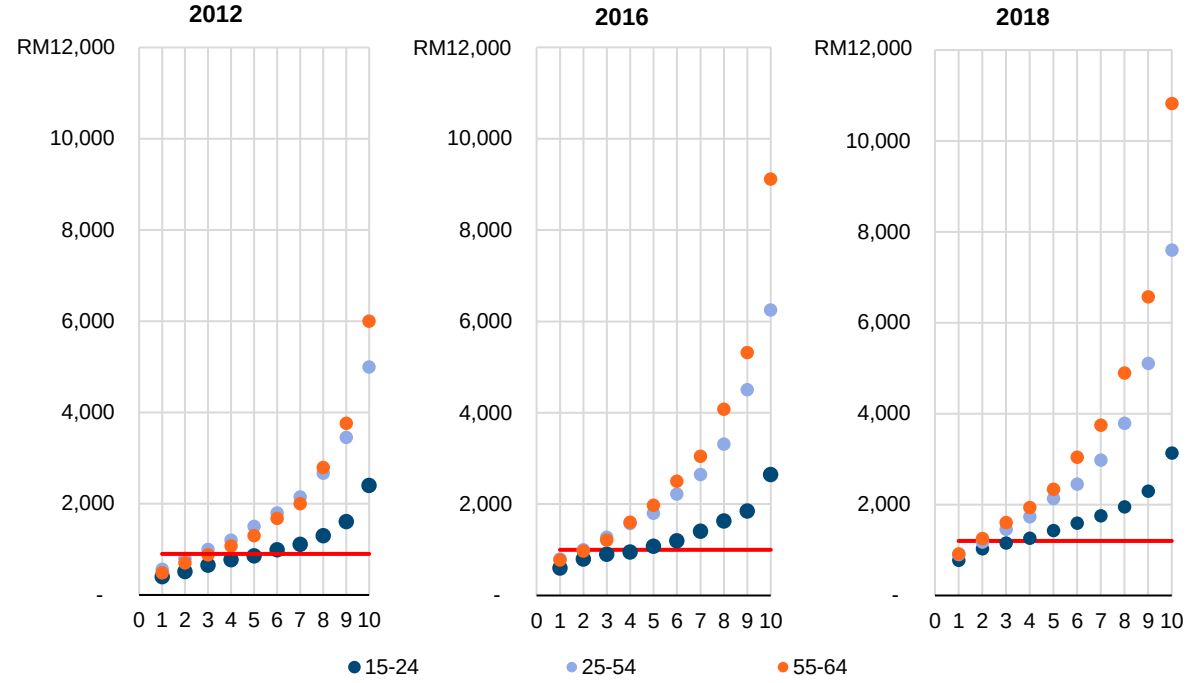


Figure 13 above presents the decile-wise median wage levels for the three age groups for the years 2012, 2016 and 2019. The horizontal red lines represent the minimum wage levels introduced in those years. Due to the overlap in values at the lower deciles, some of the differences between groups are less visually apparent, so the exact numbers are provided in Appendix 9 for reference.

The median wage level for young workers (15-24 years) is the lowest across deciles. The positional dynamic between prime age (25-54 years) and older (55-64 years) workers is interesting; for the years 2012 and 2016, the median wage level for older workers is lower at lower deciles, but shifts to being the highest wage group for the higher deciles. By 2018, the wage level for older workers is the highest across all deciles. This may indicate that the impact of the minimum wage was significant for older workers in the years 2012 and 2016, thereby potentially explaining some of the substantial declines in relative inequality ratios observed above.

The "between" results indicate that the estimated age of the highest earning worker increased by 14 years from 2010 to 2019. This occurred in tandem with an ageing population.

Figure 14: Population distribution across age groups, for 2010, 2015 and 2019

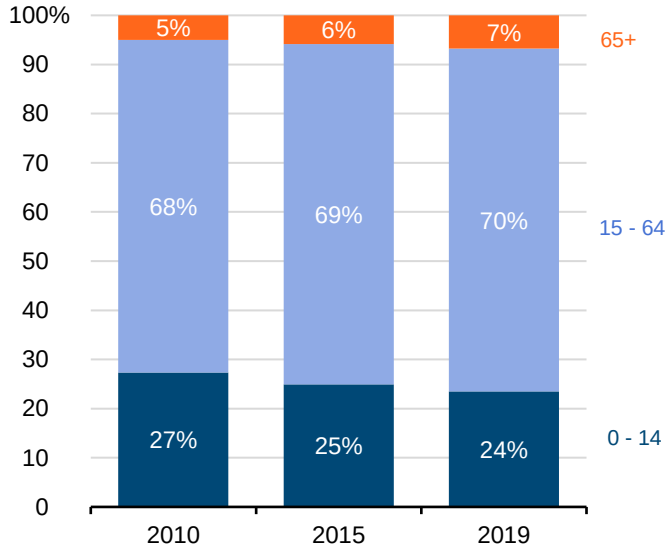


Figure 14 above presents the composition of Malaysia's population between three age groups in 2010, 2015 and 2019. Though these groups don't neatly overlap with the ones used in the analyses above, they nevertheless help illustrate the demographic shifts of an ageing population. The percentage aged 65 and above increased from 5% in 2010 to 7% in 2019, and the share aged 0-14 years declined from 27% to 24% in the same period. Malaysia transitioned into "ageing nation" status in 2020[12], and with time the population will be increasingly concentrated in older age groups.

With this context in mind, the results indicating a 14-year increase in the wage maximization point may be reflective of an ageing population and workforce, whereby Malaysians are working for a larger share of their lives and foregoing early retirement. The dearth of retirement savings[13], the absence of adequate care and productive ageing infrastructure, and the necessity of businesses adjusting to an ageing workforce could result in a wage journey that distributes more of lifetime wage growth over a longer period of time, thereby making wage increments less generous in the early years and more generous in later years.

[12] Nithiyananthan Muthusamy and Wan Amirah Wan Usamah (2022)
[13] EPF (2021)

4.3. Sector

Within

Figure 15: Percentage change in relative wage inequality ratios, by sector, 2010-2019 period

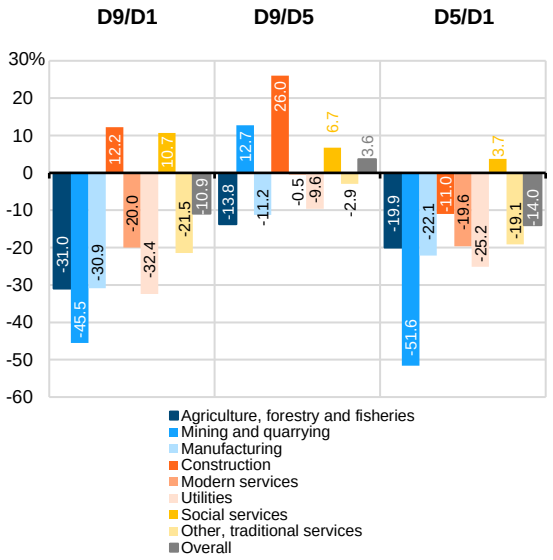


Figure 16: Interquartile range, 2010-2019, by sector

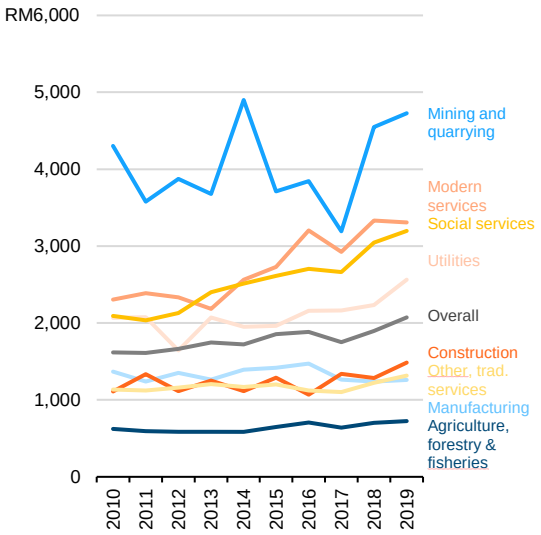


Figure 15 on the left presents the percentage changes in the relative inequality ratios across sectors. There is only one sector which matches the directional evolution of the overall category, which is mining and quarrying; a sector that comprises only 0.8% of all observations. 5 out of the 8 sector groupings experienced declines in all three relative inequality ratios; agriculture, manufacturing, modern services, utilities, and other traditional services. Social services experienced increases in all three inequality ratios, while the construction sector experienced increases in headline (D9/D1) and top end (D9/D5) inequality.

The sector with the highest level of absolute inequality (see Figure 16), as measured by the interquartile range, is mining and quarrying, and it experienced significant volatility between the RM3000 and RM 5000 levels during our study period. This volatility is expected in a sector whose fortunes are closely tied to global commodity price fluctuations. Three other sectors have absolute inequality levels higher than the overall level; modern services, social services and utilities. Social services experienced the largest increase in absolute wage inequality (+RM 1104), followed closely by modern services (+RM 1006). The IQR levels for modern services and social services closely track each other during this period. The utilities sector begins the study period with an IQR level very similar to social services but rises much more modestly (+RM 494).

Agriculture, manufacturing, construction and other traditional services all had absolute inequality levels lower than the overall level. Of these sectors, manufacturing is the most noteworthy, as it is the only one out of 8 sector groupings to have experienced a decline in absolute inequality (-RM109). Agriculture, construction and other traditional services experienced modest levels of absolute inequality growth (+RM 101, +RM 377 and +RM 183 respectively).

Between

Figure 17: Unadjusted sectoral wage differentials vs agriculture, 2010-2019 period

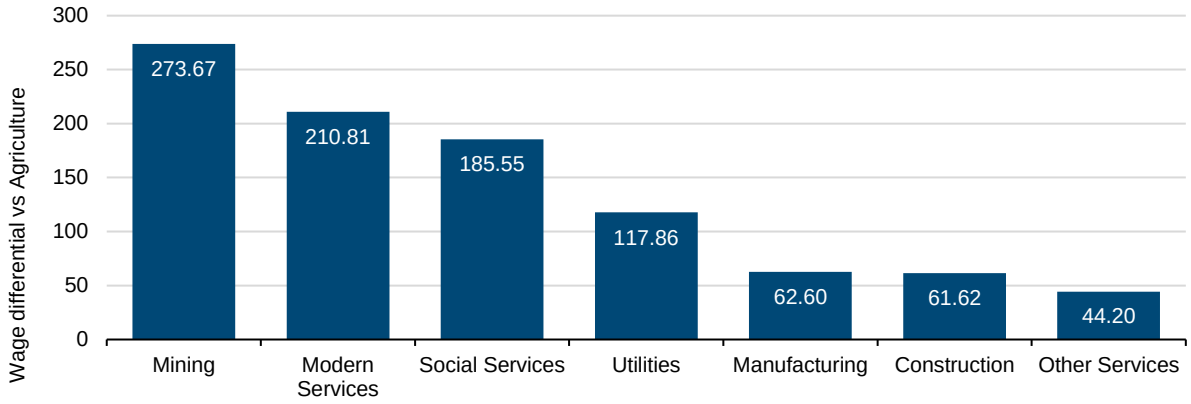


Figure 17 above presents the pooled unadjusted average wage differentials between each sector and agriculture (we use agriculture as the reference category). Mining (274%), modern services (211%), social services (186%) and utilities (118%) enjoy average wage levels that are more than double that of agriculture. Manufacturing, construction and other traditional services possess unadjusted wage premia that are within the 44 to 63 percent range. In short, without any statistical controls, all other sector categories have average wage levels that are higher than agriculture but with wide variations in magnitude.

The more interesting question is how these wage differentials are altered once the point of view shifts from raw macro averages to one determined by the perspective of a Malaysian worker with average socio-economic and socio-demographic characteristics. The adjusted numbers using the Mincerian earnings function are presented in Figure 18 and Figure 19 below.

Figure 18: Adjusted sectoral wage differentials vs agriculture (full specification), 2010-2019 period

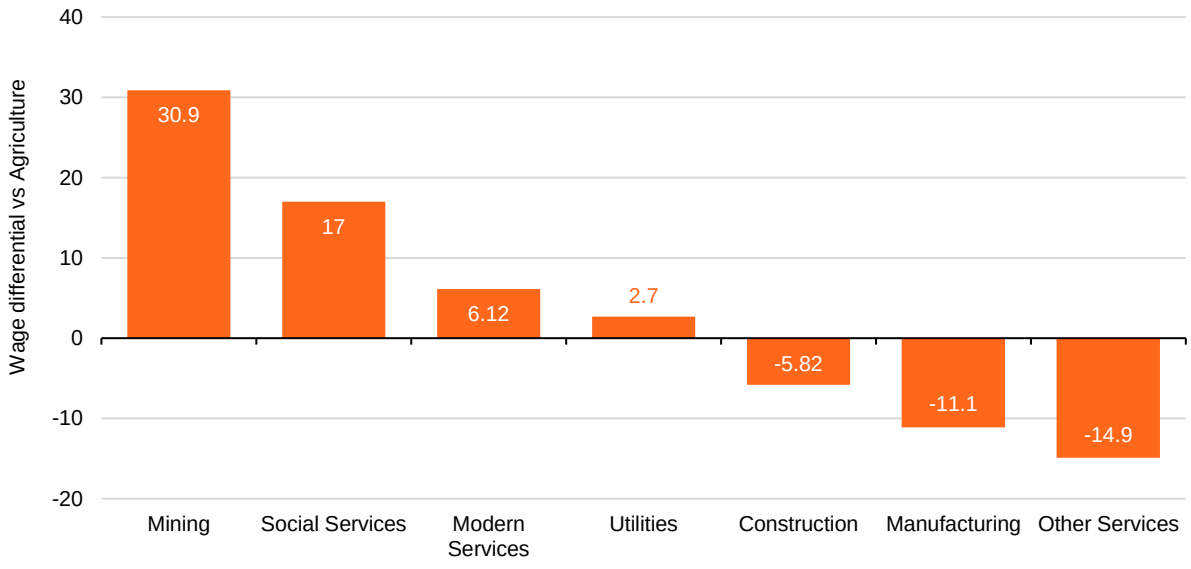


Figure 19: Adjusted sectoral wage differentials vs agriculture (sans Occ), 2010-2019 period

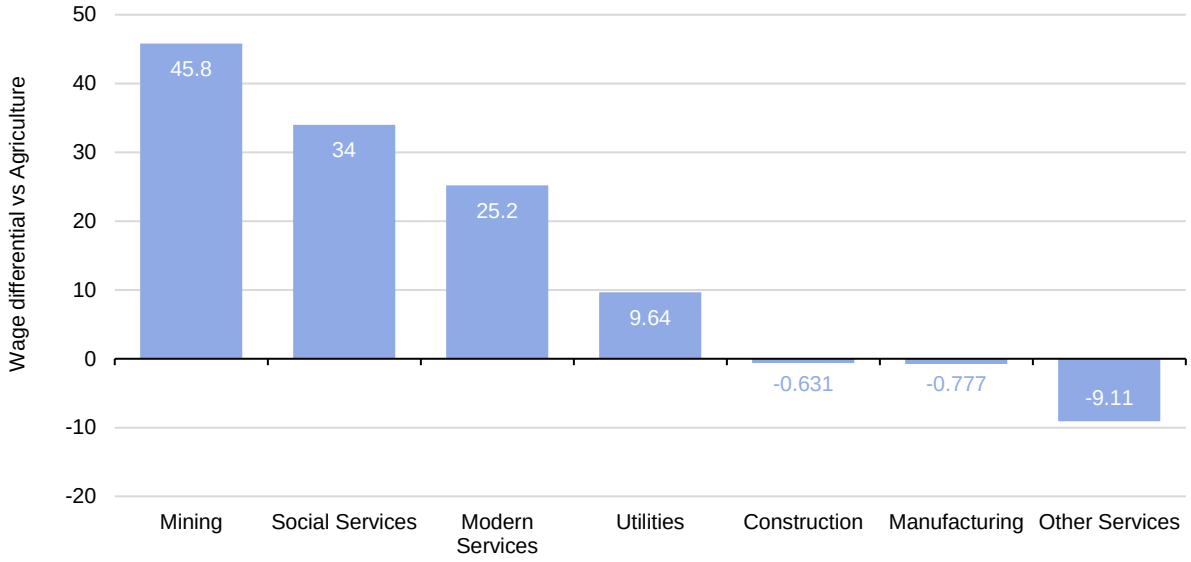
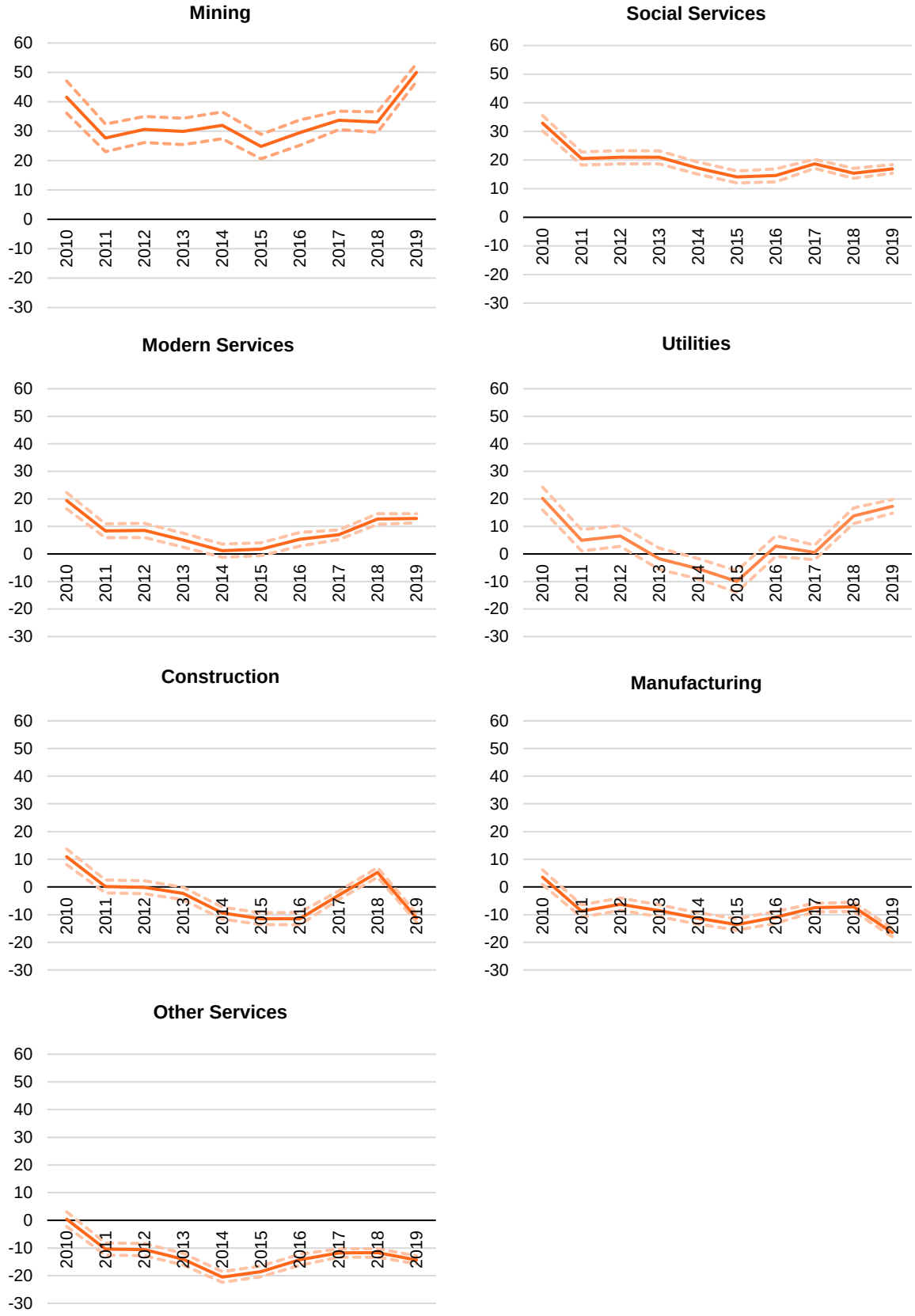


Figure 18 presents the pooled sectoral "fixed effects" from the full specification of the Mincerian earnings function, and Figure 19 presents results from the same regression function but with the occupation category removed. We remove occupation in the second regression variation because of multicollinearity concerns. The absolute value of the correlation coefficient between occupation and industry is well within reasonable bounds (0.3884), but, just as observed in the education section, the additional simpler variation(s) of the Mincerian function allow us to assess the robustness of the full function's results.

Broadly, the ordering of the sector categories according to declining wage premia are consistent between the three graphs but with two interesting exceptions. First, the positioning of social services and modern services is switched between the unadjusted and adjusted results, resulting in social services becoming the second-best remunerated sector after mining. All else held constant at the average level, working in public services, health, and education becomes more attractive from a remuneration standpoint than working in finance, real estate or ICT. Second, construction and manufacturing switch positions after adjustment. Manufacturing becomes the second worst option for remuneration for the average Malaysian worker.

Unsurprisingly, the magnitude of the wage premia vis-à-vis agriculture decline significantly with the addition of statistical controls. But the wage premia for low wage sectors (construction, manufacturing, and other traditional services) is completely lost and even reversed; the average worker would earn *less* in these sectors than in agriculture. Manufacturing, for example, declines from a wage premium of 63% over agriculture in unadjusted terms, to wage deficits of 11% (full specification) and 0.7% ("*sans* occupation" specification) in adjusted terms. It would also be interesting to observe how these wage premia evolve over time. Figure 20 below presents the yearly results for each sector from the full specification.

Figure 20: Adjusted sectoral wage differentials vs agriculture (full specification), by sector, 2010-2019



Out of the sector groups with positive pooled wage premia against agriculture, three (mining, social services, and modern services) maintain positive positions during the whole study period. The wage differential for utilities dips below zero from 2013 to 2015 (reaching -10% in 2015), but otherwise remains in positive territory. Out of the three sectors with pooled wage deficits, all three (construction, manufacturing and other traditional services) begin the study period with a positive wage differential against agriculture before declining significantly below zero. The construction sector returns to a positive premium in 2018 but is largely in negative territory during this period. The least attractive sector in terms of remuneration at the end of the study period is manufacturing, with a wage deficit of 16.5% against agriculture in 2019. The wage differential trend line for manufacturing is downward sloped and negative.

Discussion

Figure 21: Median nominal wage levels by sector and decile, for 2012, 2016 and 2018

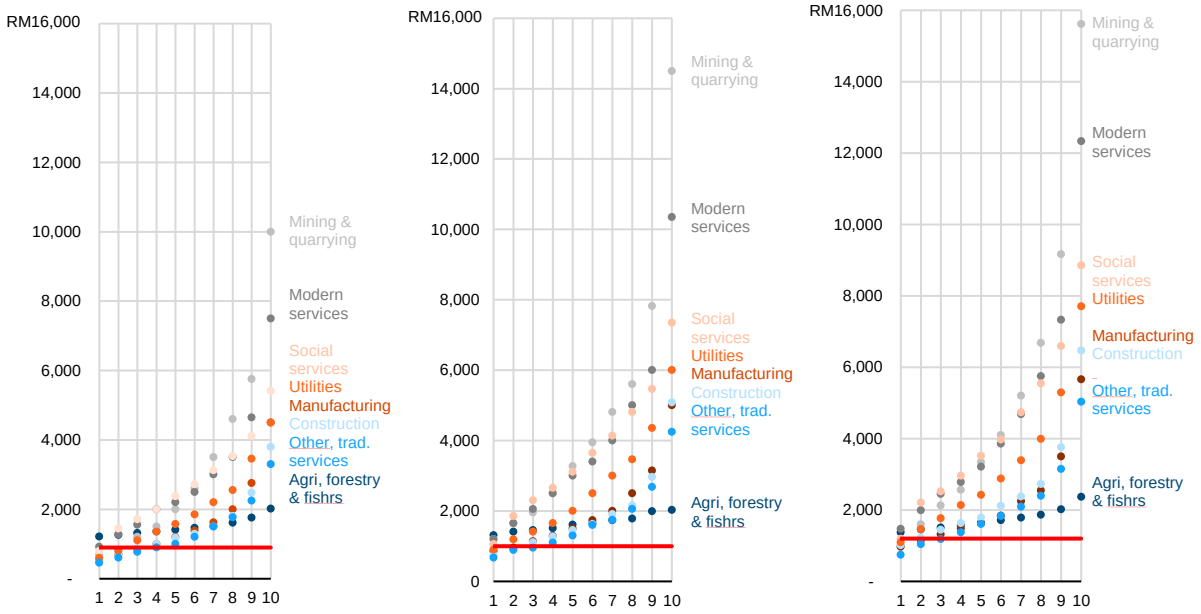


Figure 21 above provides a visual representation of median nominal wages across deciles for each sector for the years 2012, 2016 and 2018, and how they compare with the minimum wage levels introduced in those years. There is significant overlap in the lower deciles thereby making it harder to visually assess the impact of the minimum wage; the same data is also presented in tabular form in Appendix 9 for ease of reference. Sector categories such as other traditional services, manufacturing, and utilities were consistently affected by the minimum wage across these years, and demonstrate significant improvements in the relative position of low-wage workers (reductions in D9/D1 and D5/D1 ratios). The construction sector, though also affected by all three minimum wage levels, experienced an increase in headline relative inequality (D9/D1), hinting perhaps at rapid within-sector wage growth rates at the top of the distribution.

In the "between" section, it was observed that wages in the social services sector exceeded those of modern services once statistical controls were applied. Social services have a generally more compressed wage structure than modern services in both relative (lower D9/D1, D9/D5 and D5/D1 values) and absolute (lower interquartile range) terms - see Appendix 3. But a notable

pattern is that, from a within-sector perspective, median earners tend to be better positioned vis-à-vis top earners for social services; D9/D5 (top-end inequality) values are the lowest out of the three relative inequality ratios for social services, whereas the lowest for modern services is the D5/D1 (low-end inequality) ratio. Data in Appendix 9 also indicates that wage levels for middle earners is higher for social services than modern services. These empirics may help explain why social services pay better for a worker with average characteristics.

In addition, the "between" results may provide a link between Malaysia's structural economic challenges and a "squeezed middle" group of workers. To remind our readers, we found in Part I that middle-wage workers (around the median) experienced the lowest rate of wage growth during the study period, and even experienced the lowest absolute (in ringgit terms) growth during years in which the minimum wage was being implemented. It would then be useful to assess how the sectoral allocations of labour evolved during our study period, and to then observe the dependency of the middle-wage quintiles on these sectors.

Figure 22: Percentage change in employment share, by sector, 2010-2019 period

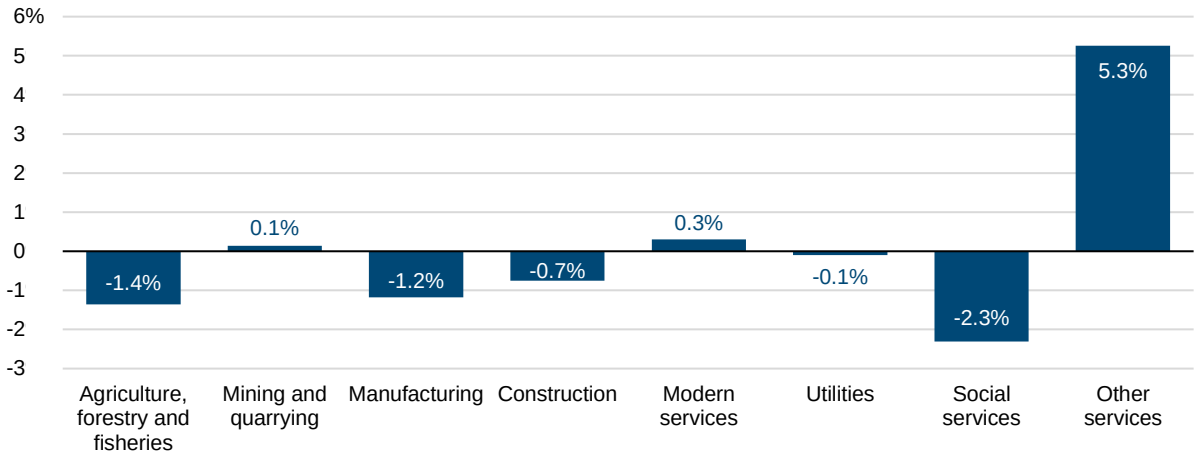
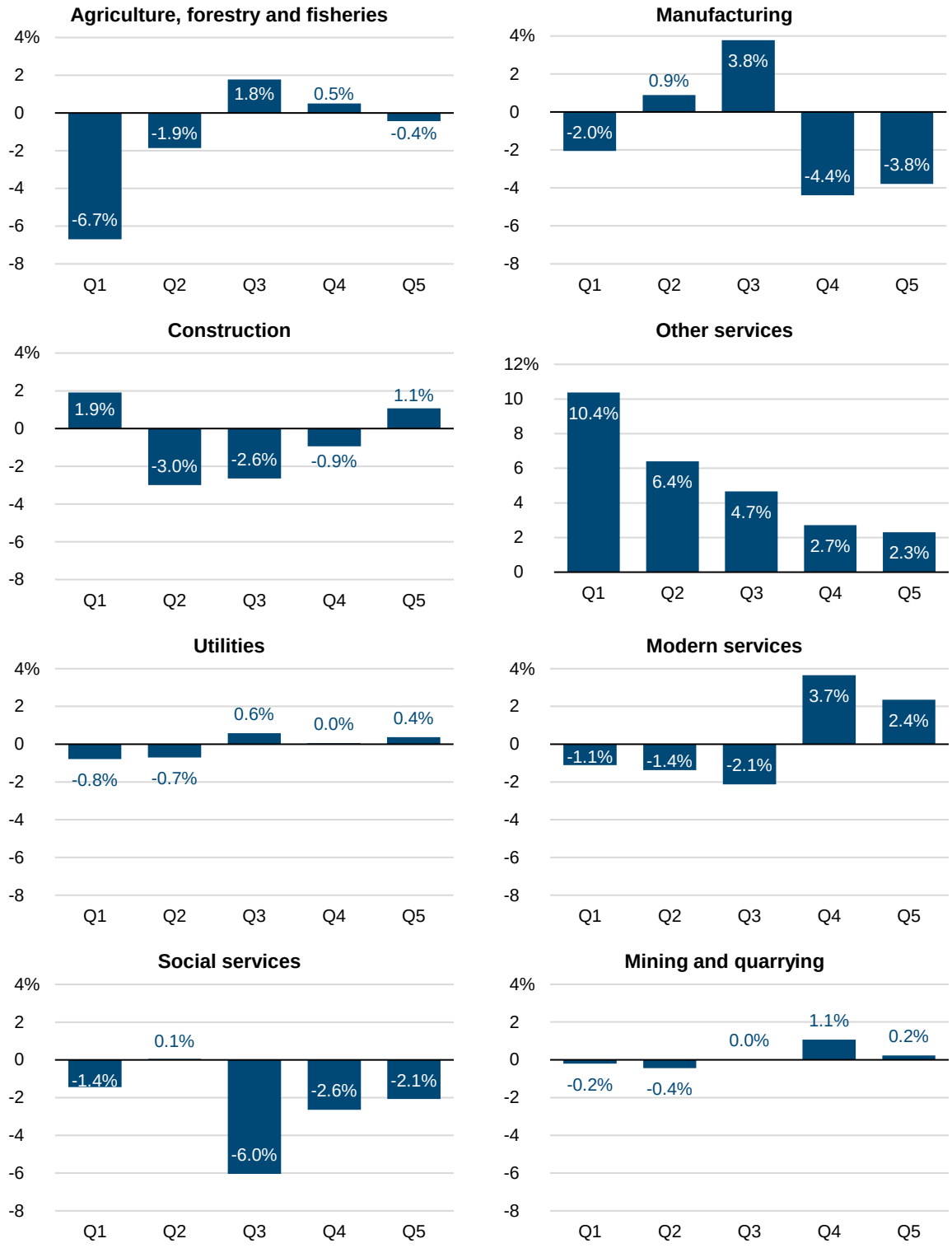


Figure 22 above presents the percentage change in employment share for each sector during our study period. It reinforces narratives, trends and analyses observed in other literature[14] that indicate labour reallocation towards less productive and remunerative sectors and the reduced dependence on manufacturing as a source of employment growth. The share of employment that flowed to other traditional services grew by 5.3%, while the shares to social services, manufacturing and agriculture declined by 2.3%, 1.2% and 1.4% respectively.

With these trends in mind, it is now useful to observe how the employment patterns of the middle quintiles evolved during this period. Figure 23 below presents the change in employment share during our study period (2010-2019) for each sector by quintile.

[14] Amanina Abdur Rahman and Achim Schmillen (2020); Tengku Mohamed Asyraf et al. (2020)

Figure 23: Percentage change in sectoral employment share for each quintile, 2010-2019 period



Quintile 3 (Q3) is of particular interest since it encompasses the "squeezed middle". Agriculture and manufacturing, both low paying sectors, increased in significance for Q3 (+1.8% and +3.8% respectively) despite declining in significance for the labour force as a whole (-1.4% and -1.2%

respectively). The only potential bright spot for Q3 is the slight increase in significance for utilities (+0.6%) but this is of a small and relatively inconsequential magnitude.

The manufacturing story is a particularly interesting one as the magnitude of its increase for Q3 (+3.8%) is bested only by other traditional services (+4.7%). The increase for traditional services isn't unique to middle earners since its share increased generally across all quintiles because of an overall drift towards lower value-added activities. Manufacturing's economic position has declined as a share of GDP in the 2000-2018 period at a rate faster than its decline in overall employment share, thereby making every unit of manufacturing employment less significant for economic growth[15]. Our results in Figure 18 and Figure 20 emphasize the poor wage performance of manufacturing relative to other sectors. Thus, the substantial rise in manufacturing's share for Q3 is a salient and remarkable trend that perhaps provides a link between Malaysia's stagnating manufacturing sector and a "squeezed middle" group of workers.

[15] Tengku Mohamed Asyraf et al. (2020)

4.4. Gender

Within

Figure 24: Percentage change in relative wage inequality ratios, by gender, 2010-2019 period

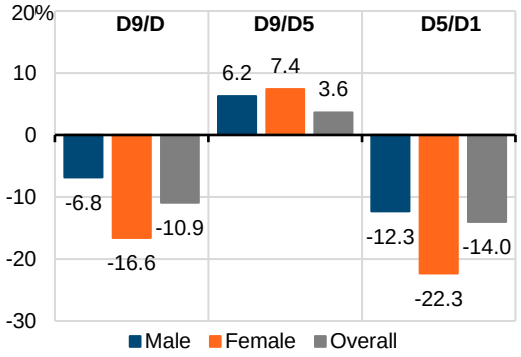


Figure 25: Interquartile range, 2010-2019, by gender

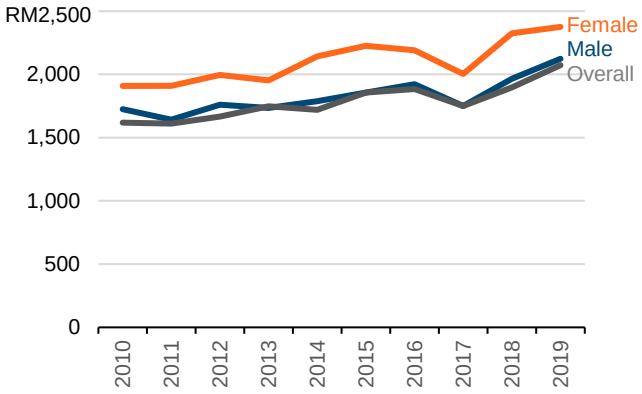


Figure 24 on the left reveals that the evolution of the relative inequality ratios for men and women were directionally identical to each other and with the overall trends observed from Part I. The ratio values themselves (see Appendix 3) are generally higher for women than men, indicating greater within-group relative inequality for women. But the magnitude of changes for women is also greater than that of men, and in the case of headline (D9/D1) and low-end (D5/D1) inequality we observe significantly greater declines for women which brings these ratio values much closer to men by 2019 (Appendix 3). This may signal a greater responsiveness of women's wages to shocks and interventions.

The absolute inequality level (Figure 25 on the right) is sizably higher for women compared to men and the overall labour force. As consistent with findings from Part I, absolute wage inequality was on an increasing trend, but the interquartile range (IQR) was between RM185 to RM371 greater for women compared to men. In addition, the increase in absolute inequality during this period was greater for women (RM 467 increase in IQR) compared to men (RM399 increase in IQR).

Between

Table 7: Unadjusted gender pay gap, 2010-2019

Year	Pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Women	RM2283	1733	1751	1857	1977	2125	2254	2398	2605	2803	2937
Male	2353	1823	1842	1933	2048	2232	2345	2500	2678	2864	3022
GPG unadjusted (%)	2.97%	4.9	4.9	4	3.5	4.8	3.9	4.1	2.7	2.1	2.8

Table 7 above presents the unadjusted gender pay gap, which in a very simple way compares the mean wage levels for women and men (see methodology section for its computation). These

include both citizens and non-citizens, and these are nominal figures unadjusted for inflation – these are the types of figures commonly used in discussions and debates on this issue.

The data in the table indicates that the average wage for women is less than men during this period, but the gap is of a low magnitude – well under 10%, and generally on a declining trend. However, this doesn't approximate the "equal pay for equal work" standard, for it doesn't control for differential selection, segregation and composition between men and women. Men and women participate in the labour force in different ways, and are organized into sectors and occupations in dissimilar patterns.

Figure 26: Distribution of workers in low, mid and high-wage sectors, by sex, 2010 – 2019 period

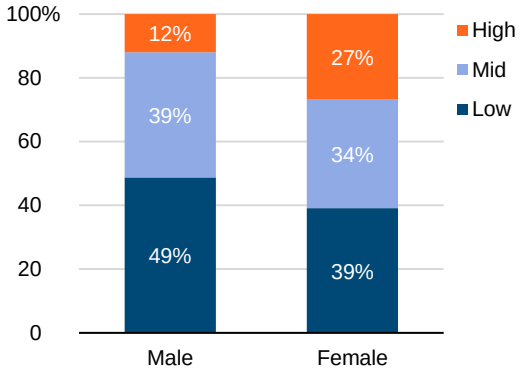
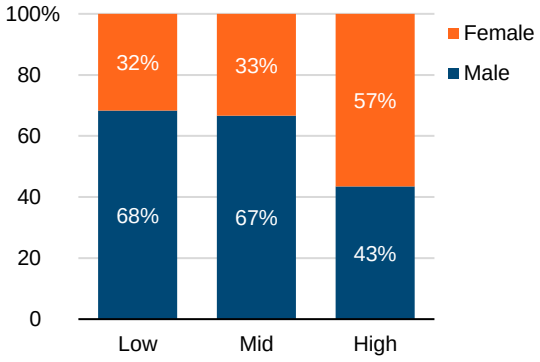


Figure 27: Gender composition of low, mid and high-wage sectors, 2010 – 2019 period



To expand on varied labour force participation patterns, observe Figure 26 and Figure 27 above. Figure 26 provides a sectoral distribution of employment within each gender. A significantly higher share of women (27%) are employed in high wage sectors[16] compared to men (12%). Analogously, male employment is much more dependent on low wage sectors (49%) compared to female employment (39%). The graph on the right (Figure 27) shifts the focus to assess the gender split within each sectoral grouping. Women occupy the majority position for employment in high wage sectors (57%), with men holding majorities in mid (67%) and low wage (68%) sectors.

Figure 28: Distribution of workers in low, mid and skilled jobs, by sex, 2010 – 2019 period

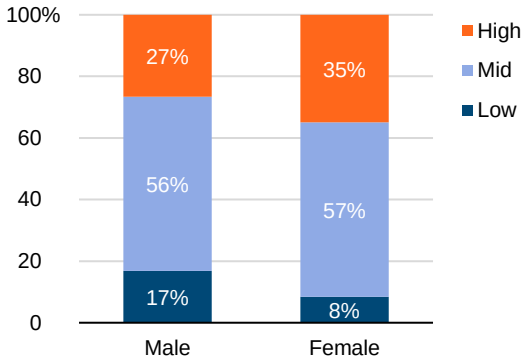
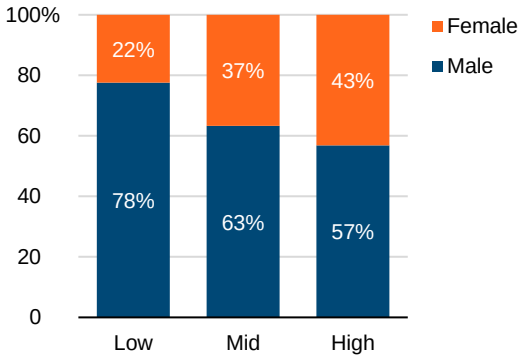


Figure 29: Gender composition of low, mid and skilled jobs, 2010 – 2019 period

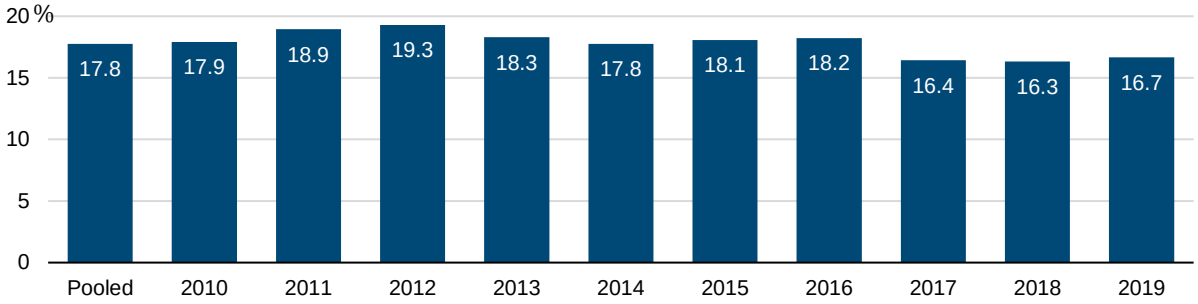


[16] See Appendix 2 for delineation of low, mid and high wage sectors.

Figure 28 and Figure 29 above reinforce these compositional factors but from the occupational angle; a larger share of women (35%) occupy jobs deemed highly skilled compared to men (27%), and the share of female employment increases with the skill-level of the occupational group.

The significance of reviewing these compositional factors is that we're observing a positive unadjusted GPG in spite of distributional data indicating more favourable employment patterns for women. This suggests that the adjusted GPG is of an order of magnitude large enough to cancel out the favourable compositional factors and produce a mean wage level for women that is lower than men.

Figure 30: Adjusted gender pay gap, 2010 – 2019



As suspected, our adjusted GPG figures are much higher (Figure 30 above). For the full study period ("pooled"), we find that the adjusted GPG is 17.8%. In other words, after controlling for segregation effects and assuming men's pay structures as the benchmark ideal, women were on average paid 17.8% less than men for the same job during the totality our study period (2010-2019). On an annual basis, the adjusted figure begins the decade at 17.9% in 2010 and ends at 16.7% in 2019. The maximum during this period is 19.3% in 2012, while the lowest is 16.3% in 2018. The overall trend during this period is of a gentle declining pattern.

Figure 31: Adjusted gender pay gap, by sector, 2010 – 2019 period

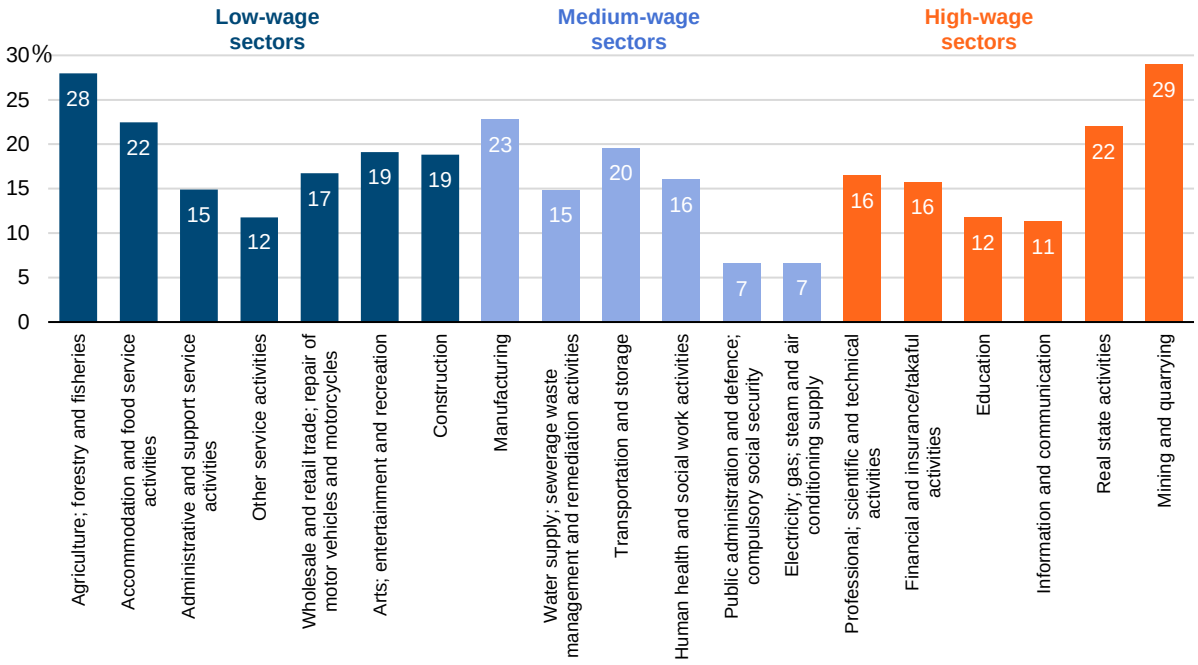


Figure 31 above presents the adjusted GPG for each sector, with the sectors organised according to low, middle and high wage groups[17]. We observe no strong correlation between the average wage of a sector and its adjusted GPG (r-squared=0.029). Only two sectors exhibit adjusted figures below 10%; (i) public administration, defence and compulsory social security, and (ii) electricity, gas, steam and air conditioning supply. Five sectors demonstrate adjusted figures above 20%; (i) agriculture, (ii) mining, (iii) manufacturing, (iv) accommodation and food service activities and (v) real estate. Most sectors (12 out of 19) have adjusted GPGs between 10 and 20 percent.

[17] See Appendix 2 for delineation of low, mid and high wage sectors.

Discussion

Figure 32: Median nominal wage levels by gender and decile, for 2012, 2016 and 2018

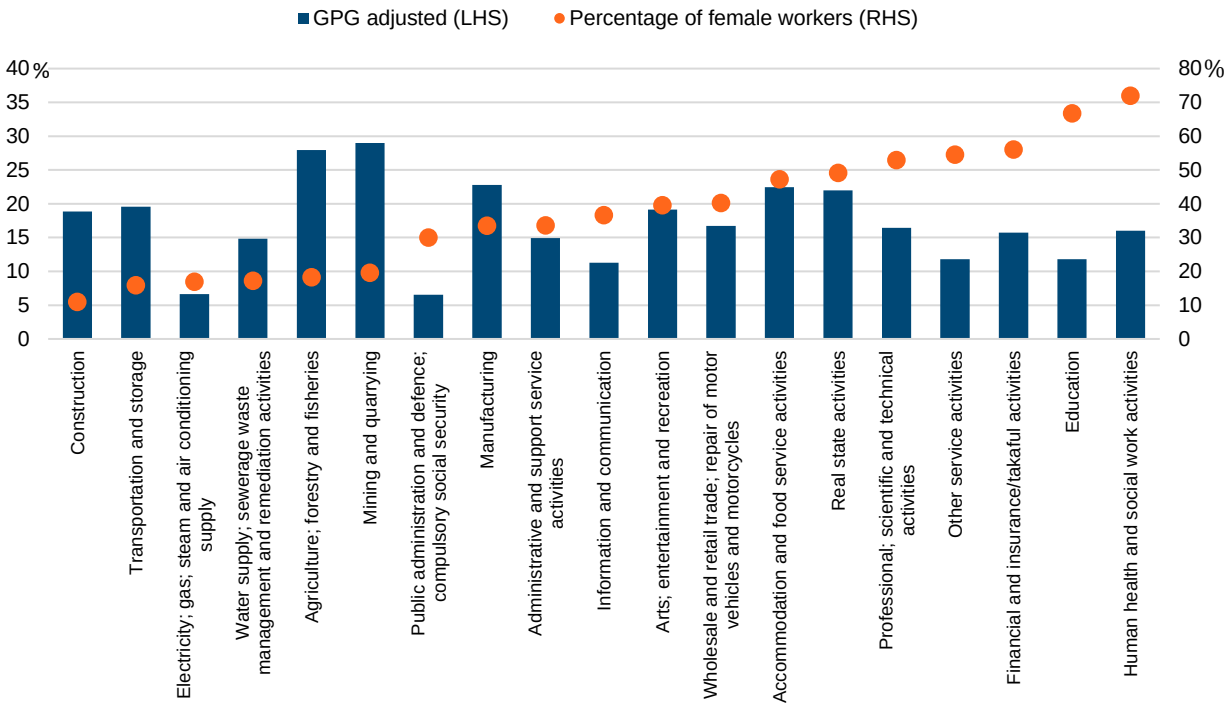
The data in Figure 32 above are interesting for two reasons. The first is that the minimum wage could explain the greater improvements in the relative positions of low wage workers among women (greater declines in the within-group D9/D1 and D5/D1 ratios for women). In the deciles affected by the minimum wage (the first two to three deciles), the median wage levels for women were lower than men, meaning the percentage improvements in their wages due to minimum wage implementation would have been of a larger magnitude.

The second point is how the median wage positions for men and women evolve relative to each other across deciles. The median level is higher for men in the lower deciles (deciles 1 to 4), whereas women enjoy higher median wage levels in the higher deciles (deciles 6 to 9) except for the top-most decile (decile 10). The data for decile 10 demonstrates that the wages of the highest earning men significantly exceed those of the highest earning women; the gap in ringgit terms for median earnings is greatest for the highest decile. This simple comparison of median levels of course does not control for segregation effects within each decile, and generating decile-wise adjusted gender pay gap (GPG) numbers could motivate future research.

In the presentation of sector-wise adjusted GPG results above, we noted how sectors such as public administration and electricity supply possessed the lowest pay gap numbers (below 10%). These sectors are likely to benefit from tightly defined wage bands at centralised levels; the public services commission (JPA) sets pay scales for most public administration staff, thereby potentially reducing the scope for gender wage differentials.

Motivated by research linking the gender pay gap to concentration of female staff[18], we attempt to assess the relationship between a sector's dependence on female workers and its adjusted GPG in Figure 33 below.

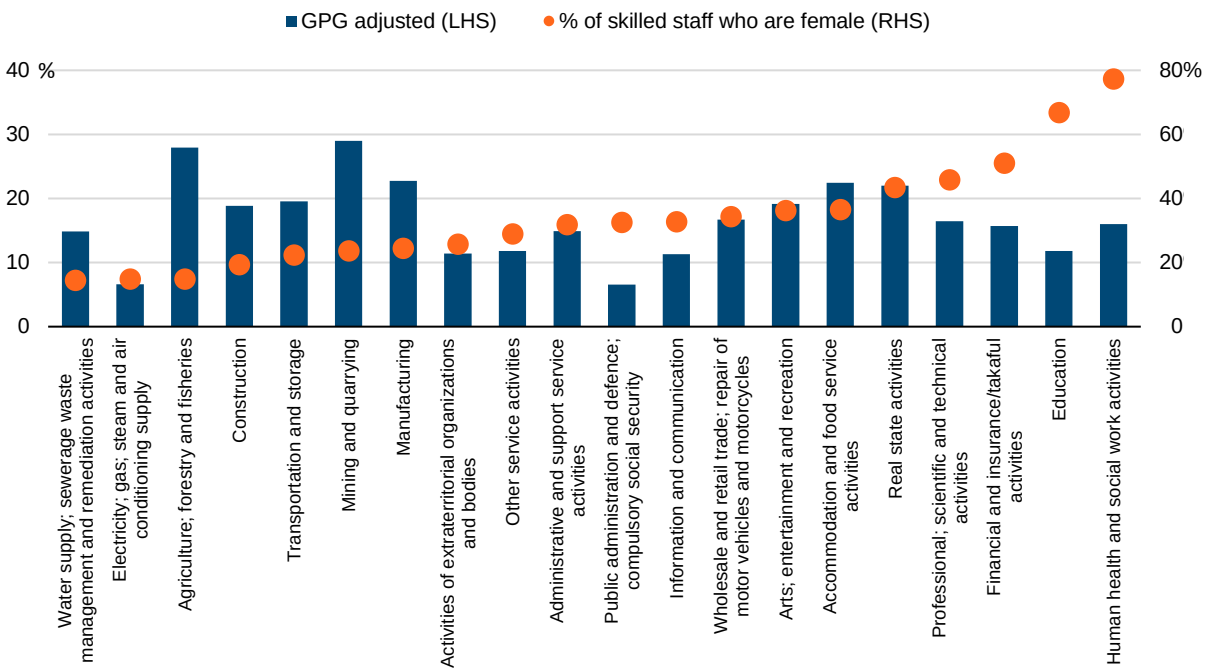
Figure 33: Adjusted gender pay gap vs. share of female workers, by sector, 2010 – 2019 period



Sectors are ordered from left to right in ascending order of dependence, with construction being the lowest (only 11% of its workforce are women), and human health and social work activities being the highest with a commanding majority of its workforce being female (72%). We do not observe a strong correlation between the adjusted GPG and dependence on women workers (r-squared=0.039). We also assess, in Figure 34 below, the relationship between the adjusted GPG and a sector's dependence on women for its high-skilled staff (professionals, managers etc), with high-skilled staff being a rough and not entirely ideal proxy for senior management.

[18] Cassells et al. (2017)

Figure 34: Adjusted gender pay gap vs. skilled female workers, by sector, 2010 – 2019 period



Again, we do not detect a significant relationship between dependence on skilled female workers and the adjusted GPG across sectors (r-squared = 0.021). The data in Figure 33 and Figure 34 above perhaps indicate that a preponderance of female employees doesn't necessarily translate to greater bargaining power to reduce the GPG.

4.5. Citizenship

Within

Figure 35: Percentage change in relative wage inequality ratios, by citizenship, 2010-2019 period

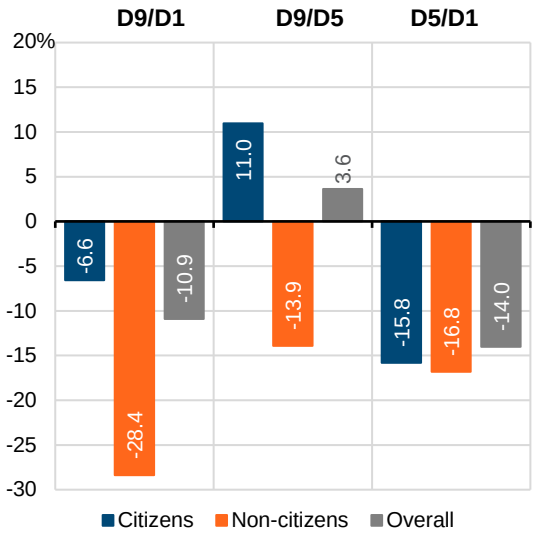
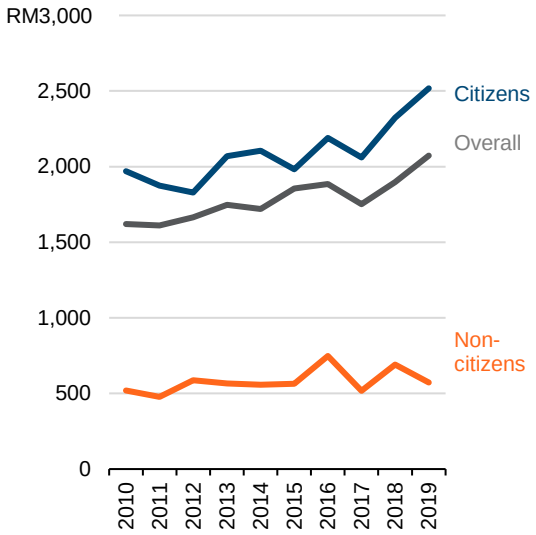


Figure 36: Interquartile range, 2010-2019, by citizenship



The relative pattern for citizens (Figure 35 on the left) is directionally consistent with the overall trend. Non-citizens, on the other hand, experienced a distinctive pattern for top-end inequality (D9/D5); a decrease of 13.9% compared to an increase of 11% for citizens. In general, these relative indicators demonstrate a more pronounced and more consistent pattern of wage compression (i.e. decline in relative wage inequality) for non-citizens compared to citizens.

The absolute inequality (interquartile range) level for citizens (Figure 36 on the right) is consistently higher than the overall level across our study period, by an amount between RM 126 to RM 445. The trend line is also on a generally increasing trajectory for citizens (from RM 1970 in 2010 to RM 2518 in 2019 – see Appendix 3). Absolute inequality for non-citizens is four to five times lower compared to citizens, and unlike the trend line for citizens and the overall labour market, remains steady within the RM500-RM600 range during our study period.

Between

Table 8: Unadjusted citizenship pay gap, 2010-2019

Year	Pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Citizens	2514	1936	1959	2052	2186	2377	2487	2657	2879	3087	3224
Non-citizens	1383	978	965	1086	1237	1311	1502	1518	1570	1603	1765
CPG unadjusted (%)	44.99%	49.48	50.74	47.08	43.41	44.85	39.61	42.87	45.47	48.07	45.25

In the previous section we applied statistical methods that brought us closer to an "equal pay for equal work" standard in analysing the gender pay gap. We adopt a similar approach in assessing the pay gap between citizens and non-citizens, which we term the citizenship pay gap (CPG). We

begin by observing the CPG unadjusted by any statistical method (Table 8 above). As noted in the methodology section, this is a simple comparison of the average levels of nominal earnings between citizens and non-citizens. We see that average nominal earnings for citizens are largely between 40 to 50 percent higher than non-citizens.

Figure 37: Distribution of workers in low, mid and high-wage sectors, by citizenship, 2010 – 2019 period

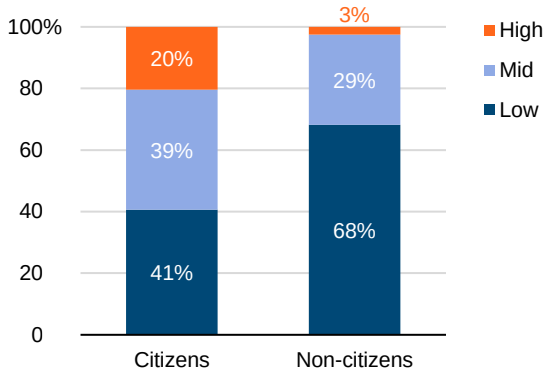
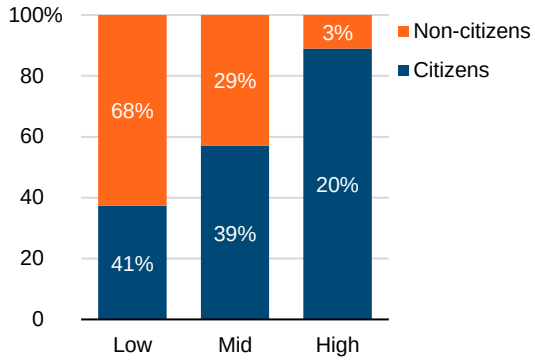


Figure 38: Citizenship composition of low, mid and high-wage sectors, 2010 – 2019 period



But the unadjusted figures in Table 8 do not account for the fact that these groups are differentially segregated in the labour market. See Figure 37 and Figure 38 above; non-citizens are primarily concentrated in low wage sectors (68%) while most citizens (59%) are in mid and high wage sectors. Low wage sectors also rely more heavily on non-citizens (68% of their workforce) as opposed to high wage sectors (only 3% are non-citizens).

Figure 39: Distribution of workers in low, mid and skilled jobs, by citizenship, 2010 – 2019 period

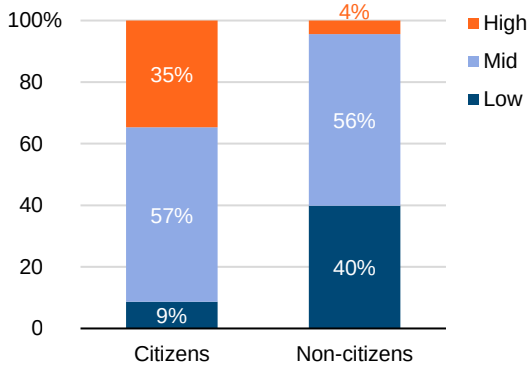
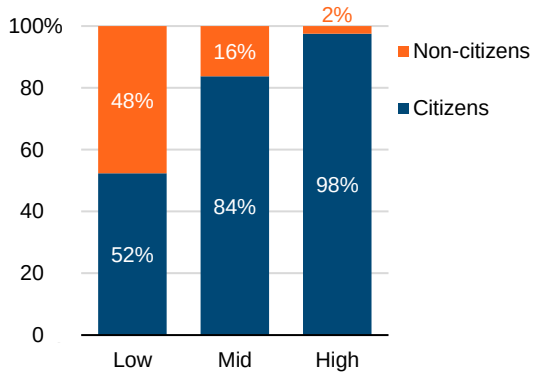


Figure 40: Citizenship composition of low, mid and skilled jobs, 2010 – 2019 period



From an occupational perspective, 40% of non-citizens are in what are characterised as low-skilled jobs, whereas the same is true for only 9% of local workers. 48% of the low-skilled workforce is foreign, whereas foreigners only make up 2% of highly skilled workers. These segregational and distributional patterns assist in partly "explaining" the large CPG numbers observed in Table 8, and hint that the adjusted CPG figures (which control for these patterns to approximate an "equal pay for equal work" standard) are much lower in magnitude.

Figure 41: Adjusted citizenship pay gap, 2010 – 2019

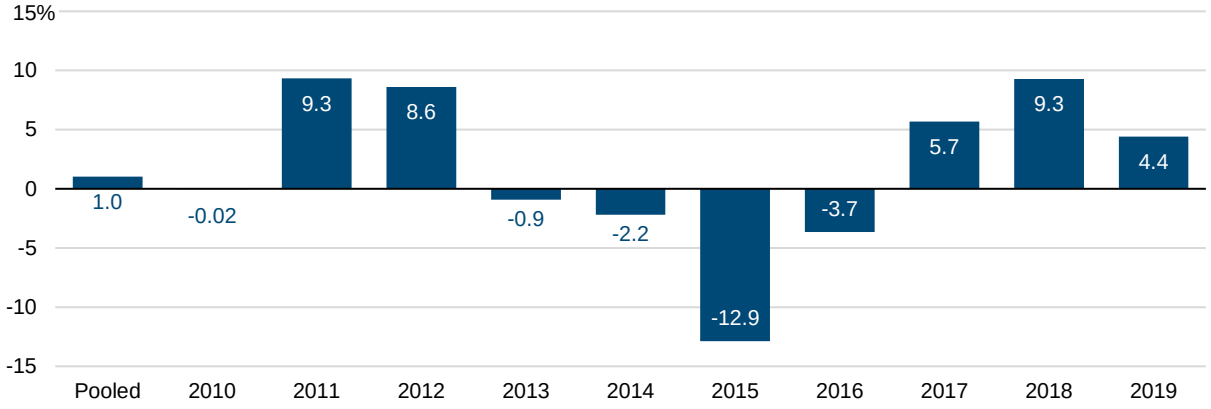
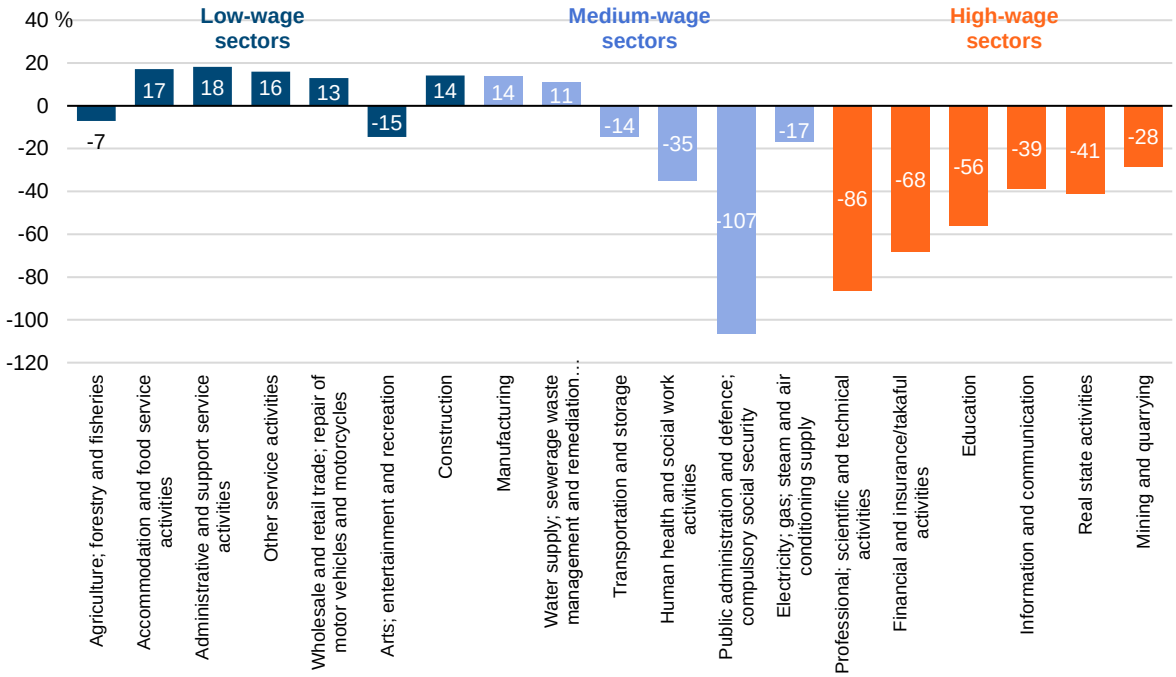


Figure 41 above presents the adjusted CPG figures for the whole study period ("pooled") and on a yearly basis. A positive adjusted CPG indicates citizens being paid more for the same job, and vice versa. We see that the "pooled" adjusted CPG (1.0%) is negligible compared to the unadjusted numbers. On an aggregate level, the segregational and distributional patterns that characterise foreign and local workers seem to "explain" nearly all the differential in average wage levels. Another point of note in the graph above is the sinuous yearly pattern of the adjusted CPG; it rises from near zero percent in 2010 to 9.3% in 2011, plunges to -12.9% in 2015, rises again to 9.3% in 2018, before ending at 4.4% in 2019. These movements appear graded and systematic, without an erratic element, thereby suggesting policy or structural factors that ebbed and flowed during the study period.

Figure 42: Adjusted citizenship pay gap, by sector, 2010 – 2019 period



As in the Gender section, we assess the variation of the adjusted citizenship pay gap (CPG) across sectors. Figure 42 above presents the sectors arrayed from left to right in order of increasing average wage levels. Unlike gender, we observe a systematic relationship between the adjusted CPG and sectoral pay levels (r-squared of 0.71 between average sector pay and adjusted CPG). This relationship is visually salient in the graph above; the adjusted CPG shifts in favour of non-citizens as the sectors transition from low to high wage. Apart from the arts and agriculture, there is generally a wage premium for local workers for the lower half of sectors ranging from 11.2% to 18.3%. In the top half we observe very significant wage premia for non-citizens, with adjusted CPGs ranging from -14.2% (transportation and storage) to -106.6% (public administration and defence; compulsory social security).

Discussion

Figure 43: Median nominal wage levels by citizenship and decile, for 2012, 2016 and 2018

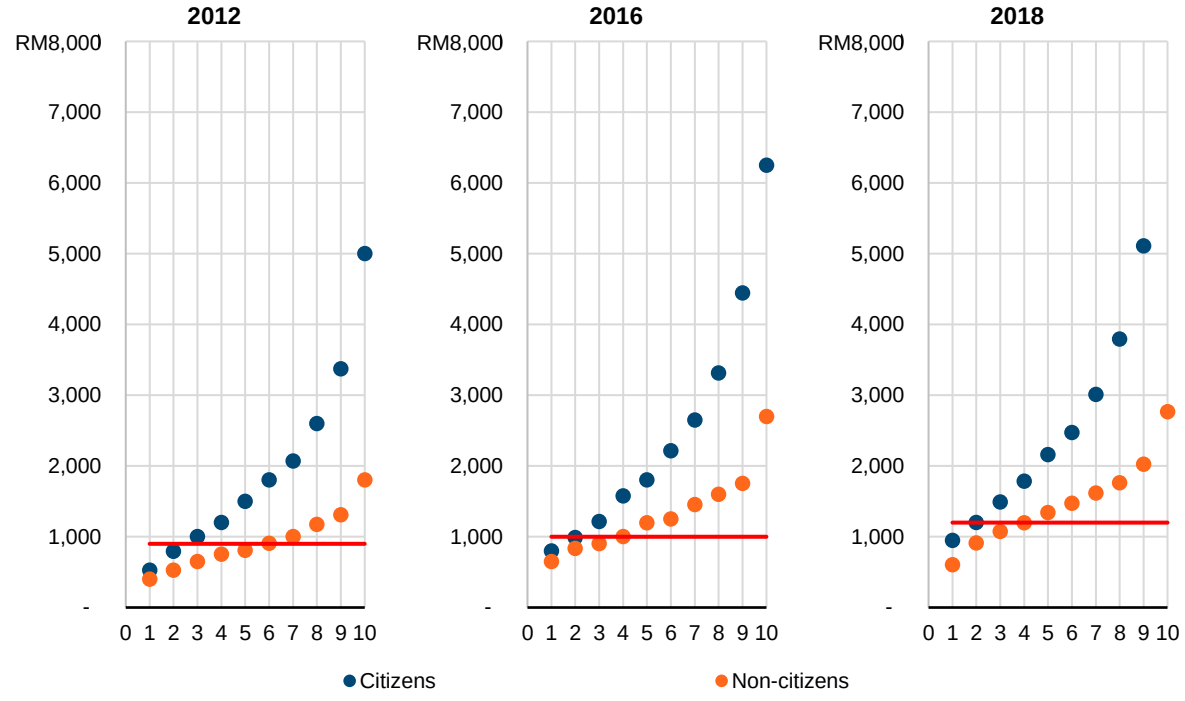
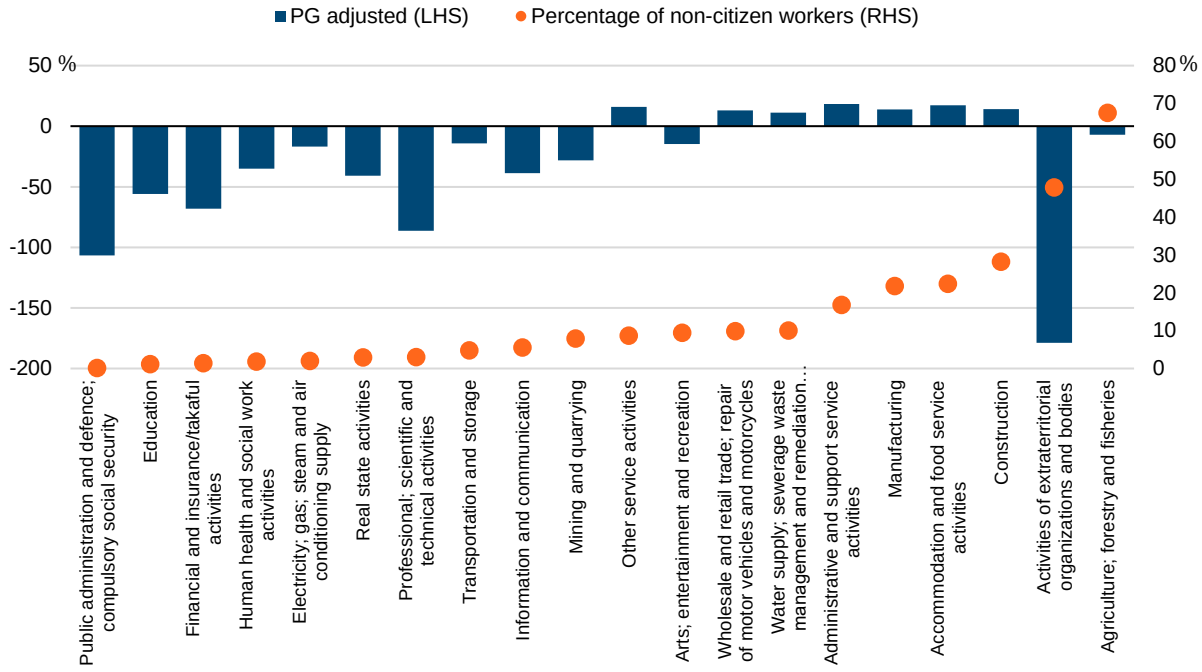


Figure 43 above demonstrates the significance of the minimum wage for foreign workers. The introduction of the minimum wage in 2012 covered non-citizens up until the sixth decile, whereas the same is true of local workers up until the second decile. This pattern persists for the two minimum wage adjustments in 2016 and 2018, where the impact zones for non-citizens (up until fourth decile) is larger than citizens (up until second decile). These data indicate that the minimum wage could be an explanatory factor behind the dramatic and consistent reductions in relative inequality indicators for non-citizens.

The minimum wage may also be relevant in explaining the yearly evolution of the adjusted CPG (Figure 41). Its sinuous pattern has been noted above, and the period of its greatest decrease, from 9.3% in 2011 to -12.9% in 2015, overlaps significantly with the "impact period" of the

minimum wage's introduction (2012-2015)[19]. Considering that most foreign workers are in low wage sectors, and the minimum wage's introduction affected a significant portion of the wage distribution for foreign workers, there may be a link between the minimum wage and the adjusted CPG, but more work is required before a definitive causal link can be made.

Figure 44: Adjusted citizenship pay gap vs. share of foreign workers, by sector, 2010 – 2019 period



To further unpack some of the sectoral trends observed in the "between" results, Figure 44 above reorders the sectors according to dependence on foreign workers. We see a positive correlation between the adjusted CPG value and a sector's dependence on foreign workers (r-squared = 0.209). The relatively higher-paying sectors on the left are far less dependent on non-citizens but demonstrate significant wage premia for foreigners. The adjusted pay gap rises to positive values (higher pay for locals) for the lower wage sectors on the right which are much more dependent on foreign workers. Does this mean that a preponderance of foreign workers weakens their bargaining power? The apparent unsoundness of this hypothesis led us to slightly reformulate our approach and to order sectors according to share of high-skilled workers among non-citizens.

[19] Nithiyananthan Muthusamy et al. (2023)

Figure 45: Adjusted citizenship pay gap vs. skilled foreign workers, by sector, 2010 – 2019 period

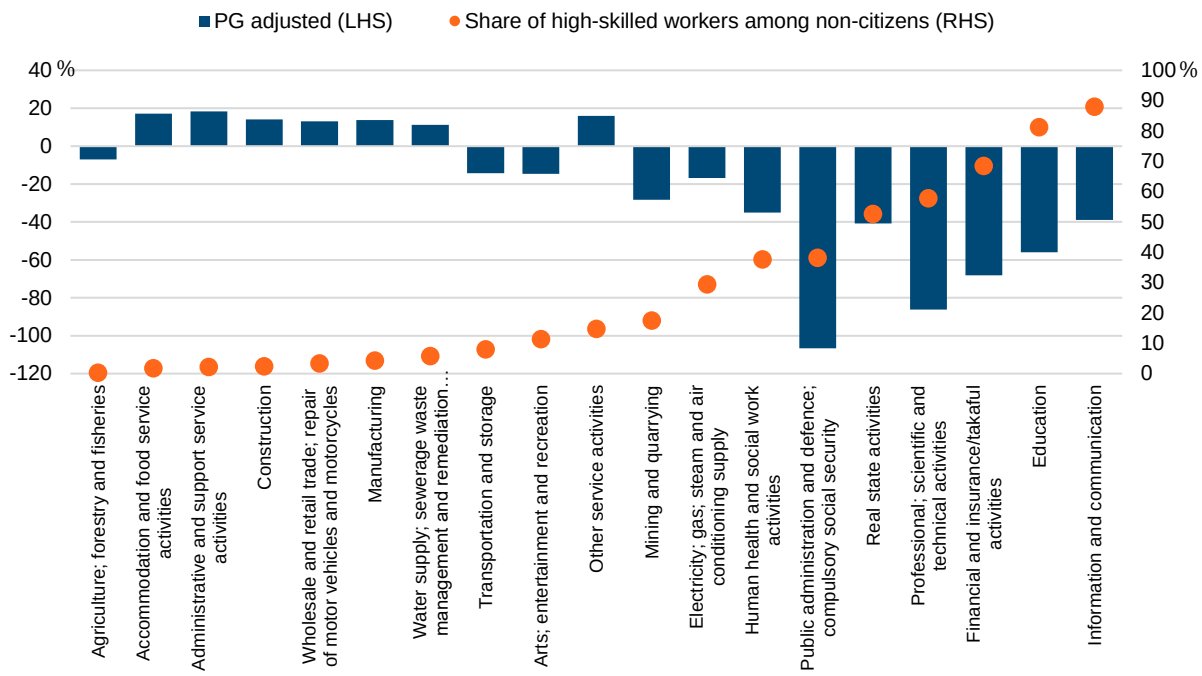


Figure **45** presents the results of this reformulation. We find a significant correlation between the adjusted CPG and the share of high-skilled workers among foreign workers (r-squared=0.557). The ordering of sectors has also been reversed between Figure 44 and Figure 45 indicating that sectors that depend heavily on foreign workers largely allocate them towards less skilled occupations, while the sectors that hire few non-citizens tend to place them in higher-skilled jobs. Another noteworthy pattern in Figure 45 is that lower wage sectors are on the left, while the more remunerative sectors are on the right.

What seems to emerge from the data is an "expat effect" for high wage sectors such as finance, real estate, ICT and professional services. These sectors hire few foreign workers but award them sizably larger salaries (wage premia ranging from 52.7% to 88.1%) compared to locals. Public administration (a medium wage sector), which covers a substantial share of the public sector, hires very few foreigners (0.14%) but nearly 40% of its foreign staff are highly skilled (perhaps as consultants), and they earn more than double the wage given to locals for the same job. On the other hand, low wage sectors (manufacturing, accommodation, retail, agriculture etc) depend heavily on foreign labour but exhibit wage deficits for foreign workers (foreigners earn from 11.2% to 18.3% less than locals for the same job). This is consistent with macro data, news events and studies linking some of these low wage sectors to the exploitation of foreign labour[20].

[20] Hwok-Aun and Pereira (2023)

5. Conclusion

The results and discussion section above covers a significant number of empirical findings across a range of dimensions, and we take some time and space here to recapitulate some of the main points and consider their policy implications.

The evidence of a declining tertiary education premium, and increasing inequality within the tertiary educated group, should encourage us to review our approach towards higher education. The overwhelming emphasis of credentialling our workforce with college or university level qualifications should perhaps be redirected towards a skills and capabilities approach that harnesses micro-credentialling and our TVET ecosystem to train the workforce of the future. TVET graduates enjoyed better employment outcomes than other graduates in the 2010 to 2020 period[21]. This does not minimize the importance of degree programs, but rather encourages a rebalancing of educational priorities. This rebalancing would need to be coordinated with major policy initiatives (such as industrial plans and economic blueprints), the hiring and promotion policies of employers, and the introduction of centralised wage setting mechanisms to ensure the fulfilment of decent work criteria.

Our labour market seems to be responding to an ageing demographic by steadily increasing the age at which the average worker maximizes their monthly wage. An older population necessitates systematic thinking about the ways in which we can encourage Malaysians to remain productive for a larger share of their lives, and the Ministry of Human Resource's "National Strategic Development Plan on Ageing Population, 2019"[22] is an attempt in that direction. It contains recommendations on delayed EPF withdrawal schemes for those in good health and with low savings, the setting of a minimum retirement age instead of a mandatory one in the public sector, and other policies towards encouraging older workers and employers to create appropriate employment opportunities in the labour market. The proposals in the strategic plan should be developed further and systematically piloted to support evidence-based decision making in this area. An additional concern is the health of older workers; data indicates that the last decade of life for most Malaysians is spent in poor health[23]. A robust expansion of public health resources that promote life-long health is crucial towards ensuring not just longer, but fuller lives.

The empirical patterns observed for wages across sectors reconfirms the oft-repeated structural challenges facing the Malaysian economy; an increasing significance of low value services and the decline of manufacturing. But our evidence also provides additional nuance to this narrative. As indicated in Part I, a key policy priority should be to ensure robust and meaningful growth in the median wage level. Middle-wage workers suffered the worst wage outcomes in the 2010-2019 period, and if the minimum wage is effective for the returns of low-wage workers, what then for the middle? What we find is that the middle has grown increasingly dependent on manufacturing as a source of employment at a time when manufacturing's heft has declined economically and for the labour market. In fact, manufacturing suffers a wage deficit compared to agriculture (the sector with the lowest average wage level) when seen from the perspective of the average

[21] Mohd Amirul Rafiq Abu Rahim and Shazrul Ariff Suhaimi (2022)
[22] MOHR (2019)
[23] KRI (2020)

Malaysian worker. The declining share of manufacturing for the top wage quintiles, and it being the only sector to have experienced a decline in our absolute wage inequality indicator, suggests its waning attractiveness as a source of high wage employment.

One response to this evidence might be to call for shifting middle-wage workers away from manufacturing and towards modern or social services. But amid geopolitical shifts that position Southeast Asia as "neutral" ground in global value chains, and a renewed domestic emphasis on industrial policy for driving future growth, it might be more appropriate to cast manufacturing as a potential engine of employment and wage growth for middle-wage workers. A disciplined and structured implementation of industrial policies is required for this vision to become a reality. We must exercise greater selectivity with regard to the FDI that is approved in Malaysia, and apply an appropriate mix of carrots and sticks to promote our domestic manufacturing players in key industries. A reduced dependence on low-wage foreign labour will also be important towards incentivizing more capital, skills and knowledge-intensive production techniques. Note in Figure 42 that the manufacturing sector pays 13.8% less for a foreign worker compared to a local for the same job.

The other noteworthy finding for our analysis of sectors is the wage attractiveness of social services (public admin, education, health etc) as a source of employment for the average worker. It outstrips modern services (finance, real estate etc) once other factors are controlled for. But the employment share for social services has declined for the labour market as a whole (-2.3%), and for middle earners in particular (-6.0%). Our public health system is in dire need of additional investment and expanded capacity[24], and recent government pledges to dramatically increase investment in health could provide a means of generating well-paying employment for social services in the public sector. The expansion of public health employment, contrary to some other forms of emoluments, would be a much-needed and valuable boost to the provisioning of an essential public good.

There is a marked contrast in the pay gap results for gender and citizenship. The gender pay gap (GPG), once adjusted for differential segmentation and distribution in the labour market, grows substantially in magnitude to indicate that women earn, on average, 17.8% less than men for the same job. This figure, though large, is consistent with global evidence; Eurostat's 2018 estimates for EU countries are mostly in the 10-20% range[25], while the ILO's estimates for the UK, US and Canada are in the 15-20% range[26].

Human capital factors cannot account for the 17.8% figure, since women now comprise the majority of university students[27] and occupy highly remunerative positions in the labour market (see Figure 26 to Figure 29). In addition to other forms of discrimination, some of the gap may be due to differences in years of experience and work hours, which we were unable to control for due to lack of data. Workplace disruptions that reduce experience and shorten hours are often linked to poorer labour market outcomes for women[28]. These disruptions could be linked to unequal burdens of care, and KRI's past work has underscored the connection between unpaid

[24] MOH (2023)
[25] Cassells et al. (2017)
[26] ILO (2022)
[27] Mohd Amirul Rafiq Abu Rahim and Shazrul Ariff Suhaimi (2022)
[28] Blau and Kahn (2017)

care work and reduced labour market hours for women in Malaysia[29]. There also seems to be no systematic relationship between our adjusted GPG and sectoral variables such as average pay and concentration of female staff. The most conspicuous finding in the sectoral results is that the lowest adjusted GPG (7%) is in a sector with well-defined pay bands (public administration).

The adjusted citizenship pay gap (CPG) is negligible (1%), indicating that almost all of the average wage differential between foreign and local workers is explained by how their labour is distributed in the market. But the sectoral results reveal interesting and important variations. Our results suggest the use of foreign workers to suppress wage levels in low to mid-wage sectors such as retail, accommodation, food, construction and manufacturing; foreign workers earn 10-20% less than local workers for the same job in these sectors. Higher wage sectors use fewer foreign workers but allocate them towards skilled roles and pay them significantly more than locals; finance pays nearly 70% more for foreign staff, while the few foreigners in the public sector receive pay levels two times higher than locals, for the same job.

The gender and citizenship results above reinforce the importance of policy action in a few areas. First, initiatives that help equalize the care burden and provide equitable access to the labour market could help narrow the gender pay gap. This includes adequate paternity leave and the provisioning of affordable childcare and old-age care. Second, centralised wage setting mechanisms and increased transparency in pay setting could help reduce the gender pay gap, and minimize the wage-depressing effects of using foreign workers with low bargaining power in critical sectors. The minimum wage is a form of centralised wage setting (a uniform wage floor), and the same principle can be extended to determine wage floors or wage bands, scaled according to skills and experience, for occupational categories in each industry[30]. The evidence of a significant wage premium for foreigners in high-wage sectors ("expat effect") is also somewhat concerning in light of Malaysia's brain drain challenge[31]; if employers are willing to pay such high premiums for skilled foreign workers, then there could be room to considerably increase local wage rates to better retain local talent. There are of course potential exceptions to this rule, such as highly specialised one-off roles for which developing local talent may be uneconomic, but these are likely to be few in number.

Finally, the results for the relative inequality ratios seem to reinforce Part I's findings on the progressive effects of the minimum wage. We broadly observe that subgroups more significantly impacted by the minimum wage experienced greater improvements in the relative positions of low wage workers (greater percentage reductions in D9/D1 and D5/D1 ratios).

[29] KRI (2019)
[30] Nithiyananthan Muthusamy and Eleanor Wilkstrom (2022)
[31] The World Bank (2011)

Appendices

Appendix 1: Salaries and wages portions of SWS questionnaire

Table A1.1: Subcategories of salaries and wages in Salaries and Wages Survey included in study

	SWS
Basic salaries/wages	Basic salaries/wages (Before deduction of income tax, EPF contributions, etc.)
Allowance	Housing/Region Housing Allowance Public Service (EKA)/Entertainment Cost of Living (COLA)/Incentive Region Payment Specialist Food Transport/Petrol Other allowances
Other cash	Commissions/Tips Others
Overtime payment	Overtime payment
Payment in kind	Food Lodging Others
Total salaries & wages received, including overtime payment	

Appendix 2: Pooled average real wage levels by industry

Sector	Average real wage, 2010 - 19	Sector rank by wage
Agriculture; forestry and fisheries	1335	**Bottom-third (Low wage)**
Accommodation and food service activities	1592	
Administrative and support service activities	1703	
Other service activities	1902	
Wholesale and retail trade; repair of motor vehicles and motorcycles	1922	
Arts; entertainment and recreation	2154	
Construction	2157	
Manufacturing	2170	**Middle (Mid wage)**
Water supply; sewerage waste management and remediation activities	2210	
Transportation and storage	2597	
Human health and social work activities	3415	
Public administration and defence; compulsory social security	3478	
Electricity; gas; steam and air conditioning supply	3691	
Professional; scientific and technical activities	3926	**Top-third (High wage)**
Financial and insurance/takaful activities	4148	
Education	4268	
Information and communication	4362	
Real estate activities	4525	
Mining and quarrying	4988	
Activities of extraterritorial organizations and bodies	7110	

Appendix 3: Decile ratios and IQR values

Education

	Primary & no formal education				Secondary				Tertiary			
	P90/ P10	P90/ P50	P50/ P10	IQR	P90/P 10	P90/ P50	P50/ P10	IQR	P90/ P10	P90/ P50	P50/ P10	IQR
2010	3.94	2.02	1.95	677	3.72	2.09	1.78	739	4.63	2.01	2.31	2,528
2011	3.95	1.98	2.00	597	4.00	2.00	2.00	776	4.89	1.95	2.51	2,489
2012	3.56	1.90	1.87	704	3.77	2.02	1.87	704	4.66	1.98	2.35	2,477
2013	3.36	1.87	1.80	586	3.55	1.97	1.80	695	4.92	2.02	2.43	2,599
2014	3.30	1.80	1.83	579	3.27	1.87	1.75	607	5.16	2.13	2.42	2,784
2015	3.17	1.81	1.75	648	3.06	1.99	1.54	644	5.04	2.11	2.38	3,016
2016	2.86	1.67	1.71	641	3.76	2.00	1.88	1,346	5.38	2.14	2.52	3,098
2017	2.48	1.67	1.49	618	3.29	1.99	1.65	1,231	4.80	2.10	2.28	2,915
2018	3.04	1.72	1.77	786	3.74	2.11	1.78	1,257	5.34	2.25	2.38	3,446
2019	2.80	1.77	1.58	719	3.63	2.17	1.67	1,420	5.49	2.17	2.53	3,869

Note: IQR = Interquartile range

Age

	15 - 24				25 - 54				55 - 64			
	P90/ P10	P90/ P50	P50/ P10	IQR	P90/ P10	P90/ P50	P50/ P10	IQR	P90/ P10	P90/ P50	P50/ P10	IQR
2010	3.89	2.16	1.80	762	6.23	2.49	2.50	1,970	9.57	3.42	2.80	2,409
2011	4.00	2.07	1.93	720	6.00	2.52	2.38	1,874	8.33	3.33	2.50	2,554
2012	3.85	2.06	1.87	763	5.71	2.50	2.29	1,913	7.58	3.00	2.53	2,218
2013	3.82	2.00	1.91	747	5.52	2.44	2.27	2,126	7.83	3.08	2.54	2,408
2014	3.33	2.00	1.67	724	5.53	2.55	2.17	2,058	7.16	2.98	2.40	2,784
2015	3.17	1.82	1.75	710	5.39	2.55	2.11	1,989	7.86	3.00	2.63	3,072
2016	3.07	1.87	1.64	771	5.56	2.50	2.22	2,142	7.11	3.01	2.36	3,002
2017	2.56	1.74	1.47	721	5.00	2.33	2.14	2,111	6.66	2.66	2.50	2,799
2018	2.77	1.71	1.62	806	5.67	2.60	2.18	2,346	7.19	2.98	2.41	3,290
2019	2.94	1.87	1.57	748	5.59	2.70	2.07	2,518	5.95	2.94	2.02	3,235

Note: IQR = Interquartile range

Sector

	Agriculture, Forestry and Fisheries				Mining & Quarrying				Manufacturing			
	P90/P10	P90/P50	P50/P10	IQR	P90/P10	P90/P50	P50/P10	IQR	P90/P10	P90/P50	P50/P10	IQR
2010	4.07	2.04	2.00	623	9.18	2.72	3.38	4,304	5.26	2.73	1.93	1,367
2011	4.02	1.94	2.07	592	10.00	3.64	2.75	3,580	5.00	2.50	2.00	1,241
2012	3.55	1.91	1.85	587	9.68	3.04	3.18	3,873	5.02	2.49	2.02	1,350
2013	3.20	1.78	1.80	586	6.50	2.78	2.34	3,678	4.43	2.38	1.86	1,264
2014	3.15	1.73	1.81	585	10.00	3.03	3.30	4,900	3.89	2.33	1.67	1,392
2015	3.04	1.81	1.68	648	8.26	2.50	3.30	3,712	3.89	2.33	1.67	1,419
2016	3.05	1.64	1.86	707	6.79	2.60	2.61	3,846	4.17	2.34	1.78	1,472
2017	2.56	1.63	1.57	640	8.33	2.70	3.08	3,193	3.70	2.24	1.65	1,263
2018	3.03	1.82	1.66	700	8.73	3.33	2.62	4,547	3.96	2.47	1.60	1,239
2019	2.81	1.76	1.60	724	5.00	3.06	1.63	4,727	3.64	2.42	1.50	1,258

Note: IQR = Interquartile range

	Construction				Modern Services				Utilities			
	P90/P10	P90/P50	P50/P10	IQR	P90/P10	P90/P50	P50/P10	IQR	P90/P10	P90/P50	P50/P10	IQR
2010	4.17	2.09	2.00	1,108	5.00	2.27	2.20	2,303	6.65	2.35	2.83	2,069
2011	5.00	2.50	2.00	1,337	5.00	2.27	2.20	2,387	5.71	2.30	2.49	2,076
2012	4.83	2.42	2.00	1,115	4.55	2.00	2.27	2,336	5.07	2.26	2.24	1,643
2013	4.29	2.31	1.86	1,253	4.58	2.20	2.08	2,184	5.00	2.50	2.00	2,070
2014	3.88	2.35	1.65	1,114	4.92	2.25	2.19	2,561	4.44	2.00	2.22	1,949
2015	4.38	2.43	1.80	1,288	5.15	2.23	2.31	2,729	5.00	2.43	2.06	1,965
2016	4.12	2.24	1.84	1,068	5.07	2.47	2.05	3,205	5.00	2.27	2.20	2,158
2017	4.00	2.39	1.67	1,339	5.07	2.45	2.07	2,925	5.00	2.22	2.25	2,163
2018	4.09	2.46	1.66	1,283	5.18	2.55	2.03	3,332	4.93	2.41	2.05	2,233
2019	4.68	2.63	1.78	1,485	4.00	2.26	1.77	3,309	4.50	2.12	2.12	2,563

Note: IQR = Interquartile range

	Social Services				Other, Traditional Services			
	P90/P10	P90/P50	P50/P10	IQR	P90/P10	P90/P50	P50/P10	IQR
2010	3.83	1.81	2.12	2,094	5.00	2.40	2.08	1,133
2011	3.73	1.84	2.03	2,035	5.00	2.50	2.00	1,122
2012	3.78	1.82	2.08	2,128	4.81	2.27	2.12	1,162
2013	4.03	1.87	2.16	2,399	4.75	2.38	2.00	1,207
2014	3.82	1.81	2.11	2,514	4.29	2.50	1.71	1,169
2015	4.05	1.87	2.16	2,615	4.00	2.31	1.73	1,201
2016	4.01	1.82	2.20	2,704	3.88	2.12	1.83	1,122
2017	3.72	1.89	1.97	2,662	3.37	1.95	1.73	1,102
2018	4.43	1.98	2.24	3,044	4.06	2.17	1.88	1,221
2019	4.23	1.93	2.20	3,198	3.93	2.33	1.68	1,316

Note: IQR = Interquartile range

Gender

	Male				Female			
	P90/P10	P90/P50	P50/P10	IQR	P90/P10	P90/P50	P50/P10	IQR
2010	5.83	2.69	2.17	1,724	6.98	2.64	2.64	1,909
2011	5.83	2.59	2.25	1,642	7.00	2.69	2.60	1,909
2012	5.59	2.55	2.20	1,761	6.62	2.43	2.73	1,995
2013	5.39	2.64	2.04	1,736	6.67	2.67	2.50	1,954
2014	5.36	2.84	1.89	1,787	6.13	2.86	2.14	2,144
2015	5.29	2.81	1.88	1,856	5.88	2.83	2.08	2,227
2016	5.34	2.79	1.91	1,923	6.13	2.91	2.11	2,190
2017	5.00	2.66	1.88	1,751	5.43	2.68	2.03	2,003
2018	5.29	2.68	1.97	1,966	5.95	2.81	2.11	2,325
2019	5.43	2.86	1.90	2,124	5.82	2.84	2.05	2,376

Note: IQR = Interquartile range

Nationality

	Citizens				Non-citizens			
	P90/P10	P90/P50	P50/P10	IQR	P90/P10	P90/P50	P50/P10	IQR
2010	6.05	2.42	2.50	1,970	3.30	1.76	1.88	520
2011	5.92	2.47	2.40	1,874	3.28	1.75	1.87	477
2012	6.00	2.49	2.41	1,829	3.27	1.71	1.91	587
2013	5.47	2.41	2.27	2,069	2.80	1.62	1.73	566
2014	5.68	2.53	2.25	2,105	2.82	1.69	1.67	557
2015	5.45	2.47	2.21	1,981	2.60	1.60	1.63	563
2016	5.56	2.50	2.22	2,190	2.56	1.67	1.54	748
2017	5.05	2.34	2.16	2,060	2.40	1.62	1.48	518
2018	5.53	2.58	2.14	2,323	2.89	1.61	1.79	691
2019	5.65	2.68	2.11	2,518	2.36	1.52	1.56	571

Note: IQR = Interquartile range

Appendix 4: Regression results of full Mincerian function, pooled and annual

VARIABLES	pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage
Johor	-	-	-	-	-	-	-	-	-	-	-
2.Kedah	-0.263***	-0.236***	-0.301***	-0.267***	-0.245***	-0.282***	-0.278***	-0.258***	-0.237***	-0.284***	-0.246***
3.Kelantan	-0.312***	-0.314***	-0.352***	-0.367***	-0.357***	-0.345***	-0.341***	-0.290***	-0.248***	-0.287***	-0.262***
4.Melaka	-0.143***	-0.133***	-0.165***	-0.147***	-0.102***	-0.147***	-0.115***	-0.154***	-0.164***	-0.147***	-0.159***
5.Negeri Sembilan	-0.0781***	-0.0418***	-0.0701***	-0.0934***	-0.00882	-0.102***	-0.0971***	-0.101***	-0.0986***	-0.0664***	-0.0849***
6.Pahang	-0.149***	-0.103***	-0.132***	-0.163***	-0.140***	-0.143***	-0.149***	-0.209***	-0.165***	-0.103***	-0.159***
7.Pulau Pinang	-0.129***	-0.0798***	-0.102***	-0.113***	-0.136***	-0.105***	-0.130***	-0.135***	-0.153***	-0.197***	-0.147***
8.Perak	-0.220***	-0.179***	-0.212***	-0.214***	-0.218***	-0.257***	-0.244***	-0.208***	-0.207***	-0.226***	-0.232***
9.Perlis	-0.265***	-0.256***	-0.280***	-0.320***	-0.286***	-0.273***	-0.235***	-0.237***	-0.239***	-0.253***	-0.263***
10.Selangor	-0.0399***	-0.0136*	-0.0550***	-0.0440***	-0.000565	-0.0414***	-0.0430***	-0.0423***	-0.0661***	-0.0516***	-0.0372***
11.Terengganu	-0.262***	-0.199***	-0.284***	-0.309***	-0.279***	-0.299***	-0.296***	-0.263***	-0.229***	-0.226***	-0.229***
12.Sabah	-0.257***	-0.285***	-0.360***	-0.369***	-0.301***	-0.288***	-0.271***	-0.244***	-0.183***	-0.128***	-0.203***
13.Sarawak	-0.215***	-0.256***	-0.286***	-0.265***	-0.203***	-0.222***	-0.255***	-0.215***	-0.156***	-0.146***	-0.169***
14.W.P. Kuala Lumpur	0.0282***	0.0468***	0.0337***	0.0262***	0.0419***	-0.00439	-0.0153*	0.0394***	0.0263***	0.0105	0.0630***
15.W.P. Labuan	-0.163***	-0.113***	-0.217***	-0.183***	-0.123***	-0.190***	-0.144***	-0.194***	-0.179***	-0.153***	-0.151***
16.W.P. Putrajaya	-0.109***	-0.0797**	-0.139***	-0.130***	-0.138***	-0.141***	-0.0917***	-0.0918***	-0.0888***	-0.105***	-0.115***
male	-	-	-	-	-	-	-	-	-	-	-
female	-0.213***	-0.220***	-0.229***	-0.237***	-0.226***	-0.223***	-0.218***	-0.224***	-0.171***	-0.196***	-0.191***
urban	-	-	-	-	-	-	-	-	-	-	-
rural	-0.135***	-0.108***	-0.107***	-0.130***	-0.122***	-0.133***	-0.0934***	-0.0999***	-0.174***	-0.219***	-0.190***
age	0.0474***	0.0640***	0.0602***	0.0613***	0.0538***	0.0535***	0.0475***	0.0461***	0.0392***	0.0250***	0.0337***
age_squared	-0.00044***	-0.00065***	-0.00061***	-0.00062***	-0.00053***	-0.00053***	-0.00044***	-0.00042***	-0.00035***	-0.00015***	-0.00027***
edu_secondary	-	-	-	-	-	-	-	-	-	-	-
edu_noformal	-0.216***	-0.279***	-0.314***	-0.267***	-0.302***	-0.279***	-0.252***	-0.173***	-0.143***	-0.0867***	-0.0949***
edu_primary	-0.168***	-0.205***	-0.195***	-0.197***	-0.187***	-0.180***	-0.176***	-0.129***	-0.123***	-0.116***	-0.124***
edu_tertiary	0.249***	0.287***	0.281***	0.259***	0.254***	0.238***	0.242***	0.242***	0.234***	0.255***	0.205***
citizens	-	-	-	-	-	-	-	-	-	-	-
non-citizens	-0.0506***	-0.0673***	-0.117***	-0.0823***	-0.0449***	-0.0228***	-0.00897	0.0191***	-0.0365***	-0.109***	-0.0632***
managers	-	-	-	-	-	-	-	-	-	-	-
professionals	-0.279***	-0.107***	-0.221***	-0.189***	-0.175***	-0.265***	-0.165***	-0.282***	-0.301***	-0.380***	-0.552***
technician	-0.563***	-0.428***	-0.504***	-0.497***	-0.491***	-0.561***	-0.513***	-0.592***	-0.575***	-0.673***	-0.832***
clericalsupport	-0.758***	-0.625***	-0.690***	-0.673***	-0.673***	-0.766***	-0.725***	-0.761***	-0.772***	-0.889***	-1.029***
servicesales	-0.880***	-0.748***	-0.835***	-0.836***	-0.817***	-0.900***	-0.850***	-0.919***	-0.842***	-0.945***	-1.146***
skilledagriforest	-1.070***	-0.911***	-1.000***	-0.947***	-1.013***	-1.060***	-1.028***	-1.058***	-0.934***	-0.919***	-1.147***
craftandrelatedtrade	-0.907***	-0.792***	-0.850***	-0.868***	-0.840***	-0.939***	-0.866***	-0.910***	-0.876***	-1.023***	-1.142***
plantmachine	-0.916***	-0.800***	-0.888***	-0.883***	-0.855***	-0.922***	-0.891***	-0.965***	-0.873***	-0.990***	-1.131***
elementaryocc	-1.052***	-0.988***	-1.033***	-1.030***	-1.007***	-1.095***	-1.021***	-1.087***	-0.985***	-1.102***	-1.271***
Ind_agriculture	-	-	-	-	-	-	-	-	-	-	-
ind_mining	0.324***	0.418***	0.288***	0.316***	0.309***	0.333***	0.265***	0.313***	0.357***	0.360***	0.509***
ind_manufacturing	-0.0881***	0.0402***	-0.0689***	-0.0422***	-0.0671***	-0.0907***	-0.107***	-0.0819***	-0.0509***	-0.0344***	-0.152***

ind_electricity	0.194***	0.312***	0.250***	0.220***	0.177***	0.0800***	0.0514*	0.131***	0.144***	0.298***	0.458***
ind_watersupply	-0.0883***	0.116***	-0.0827***	-0.0490**	-0.139***	-0.134***	-0.175***	-0.0459*	-0.0799***	0.0438**	-0.0882***
ind_construction	-0.0452***	0.107***	0.0131	0.0107	-0.0139	-0.0794***	-0.0978***	-0.0979***	-0.0171**	0.0733***	-0.104***
ind_wholesaleretail	-0.137***	-0.0225	-0.0873***	-0.0838***	-0.120***	-0.179***	-0.158***	-0.134***	-0.111***	-0.0935***	-0.144***
ind_transportation	0.0112***	0.153***	0.0573***	0.0548***	0.00893	-0.0441***	-0.000143	0.0492***	0.0223**	0.0678***	-0.0266***
ind_accommodation	-0.189***	-0.0748***	-0.168***	-0.165***	-0.177***	-0.263***	-0.241***	-0.196***	-0.123***	-0.106***	-0.186***
ind_ICT	0.0397***	0.205***	0.0558***	0.105***	0.0378**	-0.0398**	-0.00363	0.0359**	0.0507***	0.126***	0.0341***
ind_finance	0.117***	0.267***	0.169***	0.169***	0.111***	0.0841***	0.0786***	0.127***	0.133***	0.172***	0.0903***
ind_realestate	0.156***	0.196***	0.128***	0.0398	0.137***	0.0917***	0.0865***	0.150***	0.145***	0.307***	0.368***
ind_professional	0.0111**	0.0836***	0.0145	-0.00253	-0.0366**	-0.0472***	-0.0395***	-0.00767	0.0231**	0.0912***	0.177***
ind_administrative	-0.227***	-0.0346**	-0.193***	-0.197***	-0.223***	-0.276***	-0.265***	-0.231***	-0.192***	-0.249***	-0.172***
ind_publicadmin	0.280***	0.385***	0.338***	0.330***	0.339***	0.309***	0.286***	0.260***	0.278***	0.259***	0.250***
ind_education	0.0764***	0.252***	0.0431***	0.0870***	0.0548***	0.0327***	0.00885	0.0667***	0.143***	0.0975***	0.105***
ind_humanhealth	0.123***	0.285***	0.154***	0.169***	0.166***	0.128***	0.0965***	0.0955***	0.132***	0.146***	0.138***
ind_arts	-0.137***	-0.00540	-0.0810***	-0.139***	-0.166***	-0.158***	-0.165***	-0.0936***	-0.129***	-0.0564***	-0.128***
ind_otherservice	-0.141***	0.0145	-0.101***	-0.122***	-0.160***	-0.154***	-0.207***	-0.120***	-0.103***	-0.0965***	-0.133***
ind_extraterritorial	0.231***	0.885***	0.0606	0.255**	0.349***	0.123	0.215	0.338**	-0.284**	0.0617	0.447***
2010.year	-										
2011.year	-0.00770***										
2012.year	0.0197***										
2013.year	0.0792***										
2014.year	0.123***										
2015.year	0.147***										
2016.year	0.168***										
2017.year	0.208***										
2018.year	0.258***										
2019.year	0.319***										
Constant	7.347***	6.783***	7.068***	7.070***	7.236***	7.427***	7.473***	7.542***	7.643***	8.029***	8.161***
Observations	650,142	52,073	54,977	54,214	51,675	52,720	51,856	47,630	92,665	93,564	98,768
R-squared	0.623	0.617	0.626	0.629	0.621	0.633	0.630	0.619	0.597	0.592	0.651

*** p<0.01, ** p<0.05, * p<0.1

Appendix 5: Additional education regressions

Full Specification (secondary education as reference category)

	pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage
edu_noformal	-0.216***	-0.279***	-0.314***	-0.267***	-0.302***	-0.279***	-0.252***	-0.173***	-0.143***	-0.087***	-0.095***
edu_primary	-0.168***	-0.205***	-0.195***	-0.197***	-0.187***	-0.180***	-0.176***	-0.129***	-0.123***	-0.116***	-0.124***
edu_tertiary	0.249***	0.287***	0.281***	0.259***	0.254***	0.238***	0.242***	0.242***	0.234***	0.255***	0.205***
Constant	7.347***	6.783***	7.068***	7.070***	7.236***	7.427***	7.473***	7.542***	7.643***	8.029***	8.161***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	650,142	52,073	54,977	54,214	51,675	52,720	51,856	47,630	92,665	93,564	98,768
R-squared	0.623	0.616	0.625	0.628	0.620	0.632	0.629	0.619	0.597	0.592	0.651

*** p<0.01, ** p<0.05, * p<0.1

Sans ind occ (secondary education as reference category)

VARIABLES	pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage
edu_noformal	-0.324***	-0.445***	-0.463***	-0.401***	-0.423***	-0.386***	-0.360***	-0.266***	-0.224***	-0.179***	-0.154***
edu_primary	-0.270***	-0.333***	-0.316***	-0.309***	-0.297***	-0.288***	-0.285***	-0.227***	-0.208***	-0.204***	-0.210***
edu_tertiary	0.672***	0.699***	0.691***	0.687***	0.674***	0.686***	0.701***	0.693***	0.630***	0.667***	0.630***
Constant	6.087***	5.813***	5.939***	5.913***	6.057***	6.090***	6.175***	6.223***	6.423***	6.685***	6.536***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	650,142	52,073	54,977	54,214	51,675	52,720	51,856	47,630	92,665	93,564	98,768
R-squared	0.502	0.507	0.511	0.509	0.498	0.503	0.503	0.485	0.469	0.465	0.482

*** p<0.01, ** p<0.05, * p<0.1

Sans ind (secondary education as reference category)

VARIABLES	pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage
edu_noformal	-0.239***	-0.322***	-0.346***	-0.297***	-0.324***	-0.299***	-0.282***	-0.192***	-0.162***	-0.104***	-0.109***
edu_primary	-0.187***	-0.232***	-0.219***	-0.219***	-0.216***	-0.202***	-0.200***	-0.149***	-0.138***	-0.129***	-0.136***
edu_tertiary	0.288***	0.335***	0.322***	0.306***	0.305***	0.293***	0.291***	0.272***	0.258***	0.284***	0.240***
Constant	7.188***	6.746***	6.965***	6.950***	7.059***	7.199***	7.262***	7.388***	7.510***	7.924***	7.943***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	650,142	52,073	54,977	54,214	51,675	52,720	51,856	47,630	92,665	93,564	98,768
R-squared	0.594	0.588	0.595	0.600	0.585	0.595	0.596	0.592	0.569	0.565	0.611

*** p<0.01, ** p<0.05, * p<0.1

Sans occ (secondary education as reference category)

VARIABLES	pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage
edu_noformal	-0.271***	-0.368***	-0.401***	-0.337***	-0.372***	-0.342***	-0.307***	-0.215***	-0.174***	-0.130***	-0.122***
edu_primary	-0.223***	-0.283***	-0.265***	-0.263***	-0.241***	-0.241***	-0.237***	-0.174***	-0.165***	-0.166***	-0.172***
edu_tertiary	0.531***	0.580***	0.570***	0.550***	0.534***	0.537***	0.553***	0.542***	0.488***	0.524***	0.475***
Constant	6.259***	5.868***	6.030***	6.038***	6.205***	6.317***	6.401***	6.428***	6.628***	6.888***	6.839***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	650,142	52,073	54,977	54,214	51,675	52,720	51,856	47,630	92,665	93,564	98,768
R-squared	0.553	0.549	0.556	0.557	0.551	0.560	0.557	0.543	0.529	0.519	0.555

*** p<0.01, ** p<0.05, * p<0.1

Appendix 6: Additional sector regressions

Full Regression Specification (agriculture as reference category)

VARIABLES	pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage
ind_new_mining	0.309***	0.416***	0.277***	0.306***	0.299***	0.320***	0.248***	0.295***	0.337***	0.331***	0.500***
ind_new_manufacturing	-0.111***	0.0354***	-0.0877***	-0.0626***	-0.0862***	-0.113***	-0.136***	-0.110***	-0.0749***	-0.0722***	-0.165***
ind_new_construction	-0.0582***	0.109***	0.00153	-0.00127	-0.0240**	-0.0944***	-0.115***	-0.115***	-0.0299***	0.0521***	-0.112***
ind_new_modernservices	0.0612***	0.194***	0.0840***	0.0855***	0.0501***	0.0119	0.0171	0.0531***	0.0697***	0.127***	0.129***
ind_new_utilities	0.0270***	0.202***	0.0495**	0.0651***	-0.0177	-0.0536***	-0.100***	0.0286	0.00541	0.138***	0.173***
ind_new_socialservices	0.170***	0.329***	0.205***	0.210***	0.210***	0.172***	0.141***	0.146***	0.187***	0.154***	0.169***
ind_new_otherservices	-0.149***	0.00411	-0.104***	-0.106***	-0.141***	-0.205***	-0.185***	-0.142***	-0.118***	-0.117***	-0.143***
ind_new_extraterritorial	0.217***	0.877***	0.0426	0.212**	0.320***	0.135	0.197	0.335*	-0.300***	0.0465	0.462***
Constant	7.352***	6.769***	7.073***	7.076***	7.241***	7.429***	7.476***	7.539***	7.654***	8.057***	8.146***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	650,142	52,073	54,977	54,214	51,675	52,720	51,856	47,630	92,665	93,564	98,768
R-squared	0.617	0.611	0.616	0.620	0.612	0.624	0.620	0.611	0.592	0.584	0.644

*** p<0.01, ** p<0.05, * p<0.1

Sans occ (agriculture as reference category)

VARIABLES	pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage
ind_new_mining	0.458***	0.477***	0.414***	0.447***	0.479***	0.467***	0.410***	0.461***	0.477***	0.444***	0.593***
ind_new_manufacturing	-0.00777***	0.0673***	0.0117	0.0313***	0.0236**	-0.00567	-0.0194*	-0.0136	0.00896	0.00201	-0.0874***
ind_new_construction	-0.00631*	0.0705***	0.0554***	0.0447***	0.0376***	-0.0441***	-0.0511***	-0.0624***	0.00292	0.0642***	-0.0773***
ind_new_modernservices	0.252***	0.315***	0.268***	0.266***	0.244***	0.198***	0.219***	0.252***	0.249***	0.291***	0.289***
ind_new_utilities	0.0964***	0.183***	0.138***	0.132***	0.0695***	0.0111	-0.0165	0.0990***	0.0713***	0.174***	0.180***
ind_new_socialservices	0.340***	0.390***	0.362***	0.358***	0.370***	0.322***	0.315***	0.340***	0.364***	0.332***	0.328***
ind_new_otherservices	-0.0911***	0.00257	-0.0402***	-0.0617***	-0.0679***	-0.146***	-0.122***	-0.0973***	-0.0743***	-0.0819***	-0.126***
ind_new_extraterritorial	0.502***	1.113***	0.389*	0.263**	0.608***	0.356***	0.542**	0.908***	0.195	0.232**	0.672***
Constant	6.261***	5.845***	6.031***	6.038***	6.211***	6.320***	6.397***	6.416***	6.629***	6.904***	6.832***
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	650,142	52,073	54,977	54,214	51,675	52,720	51,856	47,630	92,665	93,564	98,768
R-squared	0.547	0.543	0.550	0.549	0.544	0.553	0.549	0.535	0.522	0.510	0.549

*** p<0.01, ** p<0.05, * p<0.1

Appendix 7: Gender regressions and average variable values

Male regression results (reference group)

	pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage
Age	0.051***	0.069***	0.063***	0.067***	0.058***	0.058***	0.050***	0.046***	0.039***	0.027***	0.036***
age2	-0.000***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
No formal	-	-	-	-	-	-	-	-	-	-	-
Primary	0.030***	0.043*	0.083***	0.032*	0.117***	0.092***	0.045**	0.030	-0.008	-0.039**	-0.037***
Secondary	0.171***	0.228***	0.243***	0.208***	0.273***	0.238***	0.201***	0.134***	0.096***	0.046***	0.087***
Tertiary	0.385***	0.504***	0.476***	0.432***	0.495***	0.432***	0.390***	0.336***	0.303***	0.258***	0.256***
Managers	-	-	-	-	-	-	-	-	-	-	-
Professionals	-0.271***	-0.142***	-0.231***	-0.191***	-0.161***	-0.262***	-0.156***	-0.268***	-0.280***	-0.378***	-0.527***
Technician and associate professionals	-0.594***	-0.444***	-0.556***	-0.538***	-0.510***	-0.585***	-0.555***	-0.616***	-0.605***	-0.706***	-0.840***
Clerical support workers	-0.836***	-0.707***	-0.800***	-0.772***	-0.748***	-0.844***	-0.839***	-0.815***	-0.820***	-0.974***	-1.101***
Service and sales workers	-0.875***	-0.726***	-0.889***	-0.839***	-0.790***	-0.886***	-0.852***	-0.896***	-0.852***	-0.949***	-1.132***
Skilled agricultural; forestry and fishery workers	-1.064***	-0.882***	-1.059***	-0.949***	-0.991***	-1.068***	-1.055***	-1.065***	-0.948***	-0.938***	-1.140***
Craft and related trades workers	-0.902***	-0.772***	-0.878***	-0.854***	-0.807***	-0.918***	-0.874***	-0.910***	-0.887***	-1.027***	-1.132***
Plant and machine-operators and assemblers	-0.947***	-0.810***	-0.937***	-0.906***	-0.870***	-0.958***	-0.936***	-0.985***	-0.911***	-1.049***	-1.145***
Elementary occupations	-1.045***	-0.967***	-1.053***	-1.023***	-0.976***	-1.075***	-1.038***	-1.079***	-0.986***	-1.097***	-1.256***
citizens	-	-	-	-	-	-	-	-	-	-	-
non-citizens	-0.081***	-0.099***	-0.137***	-0.117***	-0.077***	-0.064***	-0.027***	-0.003	-0.056***	-0.152***	-0.082***

Johor	-	-	-	-	-	-	-	-	-	-	-
Kedah	-0.293***	-0.258***	-0.324***	-0.276***	-0.266***	-0.312***	-0.313***	-0.289***	-0.269***	-0.317***	-0.299***
Kelantan	-0.368***	-0.325***	-0.406***	-0.416***	-0.411***	-0.411***	-0.395***	-0.358***	-0.322***	-0.335***	-0.325***
Melaka	-0.170***	-0.140***	-0.197***	-0.167***	-0.147***	-0.188***	-0.158***	-0.178***	-0.195***	-0.162***	-0.174***
Negeri Sembilan	-0.092***	-0.046**	-0.079***	-0.098***	-0.028*	-0.103***	-0.106***	-0.121***	-0.121***	-0.077***	-0.120***
Pahang	-0.165***	-0.102***	-0.143***	-0.165***	-0.154***	-0.167***	-0.163***	-0.230***	-0.194***	-0.123***	-0.181***
Pulau Pinang	-0.165***	-0.101***	-0.153***	-0.153***	-0.181***	-0.153***	-0.149***	-0.163***	-0.198***	-0.227***	-0.180***
Perak	-0.242***	-0.196***	-0.231***	-0.232***	-0.235***	-0.276***	-0.262***	-0.236***	-0.249***	-0.243***	-0.254***
Perlis	-0.311***	-0.278***	-0.332***	-0.349***	-0.327***	-0.302***	-0.306***	-0.267***	-0.296***	-0.305***	-0.325***
Selangor	-0.057***	-0.035***	-0.083***	-0.051***	-0.019*	-0.056***	-0.051***	-0.062***	-0.095***	-0.056***	-0.055***
Terengganu	-0.277***	-0.184***	-0.294***	-0.316***	-0.291***	-0.317***	-0.311***	-0.276***	-0.279***	-0.240***	-0.252***
Sabah	-0.288***	-0.303***	-0.407***	-0.422***	-0.342***	-0.327***	-0.270***	-0.265***	-0.203***	-0.157***	-0.248***
Sarawak	-0.251***	-0.279***	-0.318***	-0.287***	-0.230***	-0.249***	-0.292***	-0.254***	-0.215***	-0.194***	-0.206***
W.P. Kuala Lumpur	0.008*	0.035**	0.001	0.014	0.030**	-0.026*	-0.027*	0.036**	0.003	-0.025**	0.021**
W.P. Labuan	-0.176***	-0.087*	-0.235***	-0.192***	-0.131***	-0.219***	-0.150***	-0.212***	-0.186***	-0.190***	-0.173***
W.P. Putrajaya	-0.144***	-0.084	-0.182***	-0.183***	-0.172***	-0.181***	-0.108*	-0.128*	-0.149***	-0.127***	-0.162***
rural	-	-	-	-	-	-	-	-	-	-	-
urban	0.126***	0.102***	0.097***	0.117***	0.118***	0.130***	0.080***	0.092***	0.166***	0.203***	0.185***
Agriculture; forestry and fisheries	-	-	-	-	-	-	-	-	-	-	-
Mining and quarrying	0.338***	0.421***	0.248***	0.328***	0.333***	0.322***	0.291***	0.350***	0.387***	0.385***	0.534***
Manufacturing	-0.087***	0.039*	-0.070***	-0.036**	-0.053***	-0.123***	-0.107***	-0.077***	-0.057***	-0.032***	-0.149***
Electricity; gas; steam and air conditioning supply	0.180***	0.268***	0.231***	0.211***	0.178***	0.053	0.039	0.141***	0.146***	0.277***	0.423***
Water supply; sewerage waste management and remediation activities	-0.104***	0.140***	-0.133***	-0.034	-0.142***	-0.182***	-0.192***	-0.058*	-0.111***	0.022	-0.117***
Construction	-0.069***	0.071***	-0.018	-0.017	-0.032**	-0.138***	-0.121***	-0.088***	-0.034***	0.043***	-0.127***

Wholesale and retail trade; repair of motor vehicles and motorcycles	-0.158***	-0.053**	-0.105***	-0.096***	-0.129***	-0.230***	-0.175***	-0.162***	-0.112***	-0.109***	-0.178***
Transportation and storage	0.010*	0.134***	0.046**	0.048**	0.024	-0.064***	0.004	0.061***	0.030**	0.072***	-0.035***
Accommodation and food service activities	-0.183***	-0.095***	-0.153***	-0.147***	-0.142***	-0.290***	-0.225***	-0.174***	-0.129***	-0.092***	-0.187***
Information and communication	0.008	0.191***	0.014	0.049*	-0.007	-0.075***	-0.038	0.012	0.037*	0.103***	-0.000
Financial and insurance/takaful activities	0.101***	0.236***	0.146***	0.124***	0.120***	0.032	0.104***	0.127***	0.090***	0.154***	0.093***
Real estate activities	0.173***	0.219***	0.092*	0.057	0.185***	0.139***	0.143***	0.162***	0.145***	0.336***	0.388***
Professional; scientific and technical activities	-0.033***	0.042	-0.029	-0.058**	-0.068***	-0.106***	-0.061**	-0.048*	0.002	0.039*	0.119***
Administrative and support service activities	-0.253***	-0.054**	-0.183***	-0.195***	-0.224***	-0.334***	-0.304***	-0.266***	-0.213***	-0.285***	-0.208***
Public administration and defence; compulsory social security	0.270***	0.367***	0.342***	0.330***	0.346***	0.268***	0.287***	0.251***	0.264***	0.239***	0.236***
Education	0.087***	0.228***	0.055**	0.088***	0.094***	0.030	0.016	0.098***	0.133***	0.122***	0.131***
Human health and social work activities	0.136***	0.293***	0.206***	0.183***	0.193***	0.125***	0.123***	0.073**	0.114***	0.130***	0.194***
Arts; entertainment and recreation	-0.172***	-0.051	-0.086**	-0.187***	-0.229***	-0.206***	-0.199***	-0.111***	-0.181***	-0.067**	-0.132***
Other service activities	-0.252***	-0.132***	-0.208***	-0.250***	-0.286***	-0.293***	-0.328***	-0.253***	-0.179***	-0.188***	-0.205***

Activities of extraterritorial organizations and bodies	0.201***	0.916***	0.109	0.351**	0.244*	-0.359*	0.127	0.360*	-0.343**	0.074	0.318*
year=2010	0.000										
year=2011	0.000										
year=2012	0.028***										
year=2013	0.090***										
year=2014	0.134***										
year=2015	0.159***										
year=2016	0.184***										
year=2017	0.211***										
year=2018	0.270***										
year=2019	0.328***										
Constant	7.031***	6.399***	6.743***	6.675***	6.784***	7.047***	7.198***	7.356***	7.439***	7.804***	7.904***
Observation	400,576	32,547	34,134	33,620	32,064	32,423	31,982	29,131	56,574	57,483	60,618
R-squared	0.619	0.600	0.624	0.626	0.622	0.629	0.618	0.608	0.590	0.596	0.659

* p<0.05, ** p<0.01, *** p<0.001

Male average variable values

	pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Real wage	2,568.42680	2,245.45334	2,197.81370	2,269.16508	2,354.59531	2,485.57032	2,560.18574	2,671.36999	2,757.74317	2,919.88331	3,061.40671
Log of real wage	7.58477	7.43501	7.42910	7.45845	7.50841	7.55972	7.58385	7.63260	7.65933	7.72410	7.78833
Age	34.69561	34.41501	34.49757	34.65858	34.45592	34.71843	34.71315	34.79377	34.83790	34.88099	34.88949
Age squared	1,321.07440	1,297.72153	1,305.96311	1,318.34623	1,305.08427	1,324.10563	1,323.28429	1,326.95576	1,331.68250	1,334.24588	1,335.91539
No formal education	0.02413	0.02378	0.02301	0.02581	0.02234	0.02109	0.02677	0.02492	0.02297	0.02473	0.02566
Primary education	0.15712	0.17422	0.16835	0.17150	0.16910	0.16440	0.17114	0.15027	0.14605	0.14000	0.12392
Secondary education	0.57798	0.58093	0.59130	0.57730	0.58572	0.57936	0.55528	0.57778	0.57913	0.57370	0.58158
Tertiary education	0.24077	0.22108	0.21734	0.22539	0.22285	0.23515	0.24681	0.24703	0.25186	0.26157	0.26884

Managers	0.03350	0.04652	0.03892	0.03644	0.03219	0.03341	0.03291	0.03136	0.02985	0.02579	0.03074
Professionals	0.09507	0.06318	0.08115	0.08361	0.08388	0.08668	0.09234	0.11082	0.11078	0.11538	0.11344
Technician and associate professionals	0.13775	0.16233	0.14182	0.13716	0.12734	0.12838	0.12322	0.13452	0.13786	0.14153	0.14658
Clerical support workers	0.05234	0.06333	0.05686	0.05589	0.05418	0.04724	0.05359	0.04725	0.04983	0.04983	0.04821
Service and sales workers	0.16964	0.15339	0.16857	0.17028	0.17426	0.18628	0.17093	0.17008	0.16390	0.16993	0.16677
Skilled agricultural; forestry and fishery workers	0.02035	0.06196	0.01999	0.02068	0.02102	0.01444	0.01583	0.01419	0.01406	0.01347	0.01489
Craft and related trades workers	0.13827	0.13415	0.14979	0.15104	0.14634	0.15005	0.14017	0.14313	0.12666	0.12655	0.11843
Plant and machine-operators and assemblers	0.18420	0.18123	0.18335	0.18582	0.19382	0.17629	0.17547	0.17541	0.19031	0.18777	0.19197
Elementary occupations	0.16887	0.13392	0.15955	0.15907	0.16696	0.17723	0.19555	0.17324	0.17675	0.16975	0.16897
Non-Citizens	0.20551	0.18531	0.18949	0.19226	0.21742	0.21027	0.22290	0.21254	0.21609	0.20589	0.19769
Johor	0.12746	0.13407	0.13358	0.12960	0.12951	0.12679	0.11941	0.12385	0.12769	0.12633	0.12590
Kedah	0.05401	0.05690	0.05438	0.05265	0.05353	0.05494	0.05507	0.05220	0.05147	0.05391	0.05539
Kelantan	0.03468	0.03165	0.03363	0.03192	0.03297	0.03151	0.03642	0.03568	0.03710	0.03700	0.03774
Melaka	0.02692	0.02766	0.02703	0.02717	0.02700	0.02648	0.02000	0.02780	0.02850	0.02861	0.02901
N Sembilan	0.03319	0.03246	0.03356	0.03312	0.03287	0.03196	0.03146	0.03332	0.03427	0.03468	0.03396
Pahang	0.04856	0.04640	0.04849	0.04761	0.04589	0.04792	0.06248	0.04517	0.04538	0.04706	0.04854
P Pinang	0.06042	0.06183	0.06229	0.06097	0.06026	0.05964	0.06213	0.05971	0.05979	0.05878	0.05928
Perak	0.06941	0.07302	0.07133	0.06933	0.06790	0.07008	0.06917	0.06901	0.06757	0.06924	0.06824
Perlis	0.00562	0.00556	0.00525	0.00518	0.00522	0.00542	0.00516	0.00604	0.00598	0.00594	0.00627
Selangor	0.23053	0.22477	0.22881	0.23674	0.23467	0.23136	0.22675	0.23183	0.22968	0.23276	0.22776
Terengganu	0.02943	0.02947	0.03030	0.02938	0.02852	0.02851	0.02859	0.02974	0.02934	0.02986	0.03060
Sabah	0.12246	0.11520	0.11431	0.11467	0.12240	0.12542	0.12743	0.12855	0.12654	0.12245	0.12481
Sarawak	0.08814	0.08631	0.08499	0.08620	0.08562	0.08974	0.08657	0.09003	0.09043	0.09044	0.09003

KL	0.06297	0.06771	0.06513	0.06877	0.06714	0.06404	0.06299	0.06134	0.06063	0.05710	0.05695
Labuan	0.00350	0.00377	0.00377	0.00371	0.00364	0.00357	0.00349	0.00336	0.00326	0.00339	0.00318
Putrajaya	0.00270	0.00321	0.00316	0.00297	0.00284	0.00262	0.00288	0.00237	0.00238	0.00244	0.00234
Urban	0.76616	0.71768	0.72661	0.75278	0.75134	0.77484	0.75588	0.77439	0.78761	0.80172	0.80237
Agriculture; forestry and fisheries	0.08744	0.09251	0.07307	0.07178	0.08260	0.09392	0.11126	0.09124	0.09176	0.08278	0.08129
Mining and quarrying	0.01072	0.00825	0.00961	0.01094	0.01070	0.00915	0.01320	0.01223	0.01170	0.01060	0.01027
Manufacturing	0.21498	0.21841	0.23179	0.22900	0.22301	0.20390	0.20104	0.20587	0.21399	0.21140	0.21539
Electricity; gas; steam and air conditioning supply	0.00808	0.00772	0.00714	0.00852	0.00662	0.00773	0.00705	0.01010	0.00761	0.00889	0.00915
Water supply; sewerage waste management and remediation activities	0.00903	0.00999	0.00892	0.00904	0.00906	0.00919	0.00849	0.00832	0.00931	0.00933	0.00880
Construction	0.13053	0.12793	0.13709	0.13239	0.13867	0.13681	0.13391	0.12983	0.12676	0.12176	0.12172
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.14369	0.13834	0.14363	0.14871	0.14915	0.14875	0.13552	0.14648	0.14111	0.14208	0.14328
Transportation and storage	0.06477	0.06566	0.06335	0.06859	0.06589	0.06211	0.06248	0.06306	0.06589	0.06545	0.06554
Accommodation and food service activities	0.05647	0.04881	0.04995	0.04724	0.04676	0.05777	0.05661	0.05963	0.06136	0.06834	0.06432
Information and communication	0.01880	0.01735	0.01892	0.01784	0.01722	0.01833	0.01961	0.01903	0.01981	0.01962	0.01977
Financial and insurance/takaful activities	0.02067	0.02350	0.02171	0.02118	0.02085	0.01826	0.02120	0.01934	0.02058	0.01982	0.02082
Real estate activities	0.00481	0.00415	0.00375	0.00516	0.00502	0.00466	0.00429	0.00450	0.00549	0.00519	0.00570
Professional; scientific and	0.02084	0.02342	0.02530	0.02039	0.01948	0.01837	0.02067	0.02041	0.01989	0.01952	0.02172

technical activities											
Administrative and support service activities	0.05296	0.03595	0.04619	0.05375	0.04724	0.05852	0.05345	0.05264	0.05665	0.05934	0.06171
Public administration and defence; compulsory social security	0.08152	0.10172	0.08768	0.07933	0.08709	0.08054	0.07907	0.07944	0.07552	0.07541	0.07392
Education	0.04334	0.04542	0.04201	0.04151	0.04019	0.04234	0.04415	0.04449	0.04027	0.04768	0.04509
Human health and social work activities	0.01468	0.01333	0.01457	0.01465	0.01435	0.01299	0.01391	0.01584	0.01620	0.01554	0.01510
Arts; entertainment and recreation	0.00706	0.00769	0.00704	0.00913	0.00698	0.00802	0.00583	0.00742	0.00629	0.00637	0.00619
Other service activities	0.00938	0.00942	0.00821	0.01041	0.00876	0.00846	0.00816	0.00992	0.00961	0.01061	0.01013
Activities of extraterritorial organizations and bodies	0.00023	0.00043	0.00008	0.00043	0.00039	0.00016	0.00011	0.00020	0.00022	0.00027	0.00009
year=2010	0.08716	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2011	0.09250	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2012	0.09411	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2013	0.09794	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2014	0.10286	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2015	0.10409	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000
year=2016	0.10242	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000
year=2017	0.10527	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000
year=2018	0.10510	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000
year=2019	0.10854	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000
year=2020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Female average variable values

	Pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Real wage	2,485.35460	2,134.62668	2,089.25530	2,179.19986	2,272.05107	2,366.72394	2,461.15110	2,562.40107	2,682.63943	2,857.75761	2,975.77323
Log of real wage	7.54937	7.38747	7.37727	7.41810	7.46346	7.50064	7.54438	7.58244	7.64809	7.69520	7.75808
Age	33.68082	32.80811	33.00154	33.43365	33.33250	33.61694	33.74795	33.91087	33.93400	34.12467	34.43788
Age squared	1,236.07693	1,174.68014	1,186.95894	1,218.44479	1,212.31184	1,231.70741	1,239.91345	1,252.45746	1,254.05268	1,267.29137	1,290.28766
No formal education	0.01637	0.01927	0.01855	0.01561	0.01436	0.01592	0.01681	0.01496	0.01531	0.01593	0.01758
Primary education	0.08116	0.08851	0.08772	0.08455	0.09214	0.09199	0.08625	0.07868	0.07345	0.06631	0.06857
Secondary education	0.48687	0.51161	0.51362	0.50292	0.50291	0.49164	0.46676	0.46999	0.47888	0.47408	0.47103
Tertiary education	0.41560	0.38061	0.38011	0.39692	0.39059	0.40045	0.43017	0.43637	0.43236	0.44368	0.44282
Managers	0.02582	0.04234	0.03266	0.02668	0.02598	0.02346	0.02532	0.02287	0.02038	0.02237	0.02156
Professionals	0.20608	0.11031	0.18832	0.19527	0.18887	0.19185	0.20648	0.23588	0.23507	0.24054	0.23620
Technician and associate professionals	0.11732	0.19436	0.11079	0.11626	0.11317	0.10943	0.10894	0.11130	0.11206	0.10840	0.10491
Clerical support workers	0.23224	0.26130	0.24669	0.24546	0.24127	0.23255	0.23167	0.21430	0.22049	0.22222	0.21950
Service and sales workers	0.21603	0.17269	0.21369	0.21176	0.22615	0.22796	0.22737	0.21528	0.21414	0.21643	0.22528
Skilled agricultural; forestry and fishery workers	0.00540	0.02908	0.00381	0.00467	0.00500	0.00396	0.00292	0.00269	0.00235	0.00259	0.00207
Craft and related trades workers	0.01891	0.01973	0.02371	0.02273	0.02060	0.01850	0.01942	0.01896	0.01738	0.01652	0.01379
Plant and machine-operators and assemblers	0.09367	0.10878	0.10710	0.09909	0.09185	0.09356	0.07580	0.08602	0.09099	0.09369	0.09498
Elementary occupations	0.08454	0.06141	0.07324	0.07809	0.08711	0.09873	0.10207	0.09271	0.08712	0.07725	0.08172
Non-Citizens	0.09497	0.08649	0.07955	0.07712	0.08998	0.10845	0.09678	0.09914	0.10638	0.09731	0.10065

Johor	0.11341	0.11991	0.11783	0.11360	0.11952	0.10899	0.10974	0.11246	0.11082	0.11281	0.11121
Kedah	0.05611	0.05858	0.05477	0.05121	0.05192	0.05514	0.06033	0.05735	0.05659	0.05871	0.05583
Kelantan	0.03359	0.03029	0.03201	0.03366	0.03073	0.03311	0.03254	0.03729	0.03461	0.03573	0.03446
Melaka	0.03070	0.03242	0.03160	0.03034	0.03070	0.03074	0.02191	0.03188	0.03236	0.03283	0.03211
N Sembilan	0.03283	0.02998	0.03320	0.03492	0.03362	0.03257	0.03113	0.03380	0.03240	0.03425	0.03218
Pahang	0.04072	0.03951	0.03802	0.03867	0.03631	0.04108	0.05782	0.03992	0.03804	0.03803	0.03941
P Pinang	0.07209	0.07676	0.07300	0.07314	0.07360	0.07492	0.06904	0.07308	0.07012	0.07166	0.06754
Perak	0.06950	0.06696	0.07170	0.07000	0.06673	0.07017	0.06969	0.06960	0.06902	0.07146	0.06923
Perlis	0.00629	0.00623	0.00610	0.00608	0.00603	0.00615	0.00633	0.00670	0.00614	0.00607	0.00695
Selangor	0.25873	0.24844	0.25758	0.26601	0.26184	0.25296	0.24066	0.25307	0.26397	0.26259	0.27607
Terengganu	0.02610	0.02575	0.02750	0.02654	0.02537	0.02410	0.02579	0.02537	0.02699	0.02616	0.02730
Sabah	0.10448	0.09888	0.09567	0.09654	0.10371	0.11128	0.11879	0.10804	0.10679	0.10035	0.10205
Sarawak	0.07119	0.06936	0.06552	0.06833	0.06657	0.07240	0.07442	0.07332	0.07270	0.07382	0.07313
KL	0.07586	0.08705	0.08570	0.08143	0.08468	0.07783	0.07382	0.06993	0.07201	0.06755	0.06555
Labuan	0.00315	0.00352	0.00343	0.00347	0.00312	0.00306	0.00312	0.00326	0.00275	0.00319	0.00276
Putrajaya	0.00527	0.00636	0.00636	0.00605	0.00556	0.00551	0.00486	0.00494	0.00469	0.00481	0.00422
Urban	0.81966	0.76672	0.78507	0.79767	0.80474	0.82259	0.80955	0.82736	0.84403	0.85053	0.86068
Agriculture; forestry and fisheries	0.03394	0.04030	0.02186	0.02010	0.02896	0.04827	0.04936	0.03767	0.03578	0.02925	0.02674
Mining and quarrying	0.00452	0.00347	0.00421	0.00496	0.00461	0.00462	0.00357	0.00630	0.00435	0.00466	0.00422
Manufacturing	0.18784	0.20806	0.21221	0.19942	0.18606	0.18517	0.16227	0.18129	0.18652	0.18359	0.18290
Electricity; gas; steam and air conditioning supply	0.00286	0.00338	0.00259	0.00317	0.00276	0.00368	0.00148	0.00412	0.00283	0.00237	0.00236
Water supply; sewerage waste management and remediation activities	0.00325	0.00392	0.00371	0.00358	0.00348	0.00330	0.00217	0.00343	0.00310	0.00328	0.00285
Construction	0.02796	0.02785	0.03055	0.03016	0.02798	0.02634	0.02781	0.02638	0.02826	0.02939	0.02567

Wholesale and retail trade; repair of motor vehicles and motorcycles	0.16744	0.15237	0.16502	0.16120	0.16972	0.16863	0.17138	0.16788	0.17340	0.16672	0.17326
Transportation and storage	0.02115	0.02302	0.02375	0.02199	0.01659	0.01882	0.02104	0.02300	0.01852	0.02392	0.02125
Accommodation and food service activities	0.08763	0.07550	0.07890	0.08522	0.08885	0.08520	0.08199	0.08642	0.09036	0.09553	0.10203
Information and communication	0.01882	0.01678	0.01650	0.02421	0.01772	0.02175	0.01981	0.01715	0.01785	0.01890	0.01759
Financial and insurance/takaful activities	0.04572	0.05017	0.04747	0.04924	0.04442	0.04153	0.04861	0.04316	0.04821	0.04129	0.04485
Real estate activities	0.00804	0.00697	0.00612	0.00634	0.00846	0.00808	0.00727	0.00779	0.00823	0.01126	0.00893
Professional; scientific and technical activities	0.04054	0.03496	0.04080	0.04143	0.04072	0.03841	0.04184	0.04129	0.03831	0.04317	0.04320
Administrative and support service activities	0.04652	0.03123	0.03569	0.04156	0.04699	0.04881	0.05222	0.04983	0.04714	0.05012	0.05522
Public administration and defence; compulsory social security	0.06040	0.07680	0.06635	0.06307	0.06838	0.06003	0.06177	0.05621	0.05721	0.05079	0.05044
Education	0.15054	0.15848	0.15198	0.15056	0.15067	0.14846	0.15634	0.14987	0.14121	0.15404	0.14655
Human health and social work activities	0.06526	0.05580	0.06080	0.06601	0.06529	0.06027	0.06630	0.07121	0.07107	0.06600	0.06680
Arts; entertainment and recreation	0.00800	0.00890	0.01001	0.00820	0.00919	0.00791	0.00637	0.01017	0.00735	0.00715	0.00561
Other service activities	0.01948	0.02203	0.02137	0.01943	0.01904	0.02025	0.01835	0.01684	0.02027	0.01848	0.01946

Activities of extraterritorial organizations and bodies	0.00011	0.00002	0.00010	0.00015	0.00012	0.00046	0.00005	0.00000	0.00003	0.00008	0.00010
year=2010	0.08237	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2011	0.08889	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2012	0.09118	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2013	0.09493	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2014	0.10320	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2015	0.10117	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000
year=2016	0.10422	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000
year=2017	0.10929	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000
year=2018	0.10897	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000
year=2019	0.11578	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000
year=2020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Appendix 8: Citizenship regressions and average variable values

Citizen regression results (reference group)

	pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage	ln _real wage
Age	0.056***	0.072***	0.066***	0.068***	0.062***	0.064***	0.058***	0.055***	0.047***	0.037***	0.039***
age2	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.000***	-0.000***	-0.000***
No formal	-	-	-	-	-	-	-	-	-	-	-
Primary	0.159***	0.204***	0.251***	0.169***	0.143***	0.149***	0.208***	0.108***	0.087***	0.096***	0.100***
Secondary	0.388***	0.452***	0.507***	0.387***	0.416***	0.378***	0.433***	0.325***	0.274***	0.287***	0.249***
Tertiary	0.640***	0.740***	0.792***	0.658***	0.672***	0.620***	0.674***	0.570***	0.507***	0.546***	0.455***
Managers	-	-	-	-	-	-	-	-	-	-	-
Professionals	-0.267***	-0.106***	-0.214***	-0.191***	-0.171***	-0.251***	-0.146***	-0.270***	-0.304***	-0.363***	-0.551***
Technician and associate professionals	-0.542***	-0.413***	-0.476***	-0.480***	-0.471***	-0.541***	-0.473***	-0.567***	-0.571***	-0.648***	-0.827***
Clerical support workers	-0.731***	-0.607***	-0.665***	-0.648***	-0.645***	-0.735***	-0.676***	-0.731***	-0.765***	-0.857***	-1.015***
Service and sales workers	-0.833***	-0.709***	-0.788***	-0.788***	-0.764***	-0.845***	-0.781***	-0.877***	-0.820***	-0.900***	-1.113***
Skilled agricultural; forestry and fishery workers	-0.873***	-1.106***	-0.840***	-0.864***	-0.858***	-0.880***	-0.730***	-0.920***	-0.837***	-0.716***	-0.948***
Craft and related trades workers	-0.857***	-0.736***	-0.806***	-0.816***	-0.794***	-0.870***	-0.798***	-0.864***	-0.854***	-0.971***	-1.108***
Plant and machine-operators and assemblers	-0.870***	-0.750***	-0.837***	-0.833***	-0.786***	-0.888***	-0.825***	-0.903***	-0.875***	-0.953***	-1.106***
Elementary occupations	-1.039***	-0.965***	-1.036***	-1.024***	-0.996***	-1.070***	-0.977***	-1.056***	-0.984***	-1.094***	-1.271***
male	-	-	-	-	-	-	-	-	-	-	-
female	-0.211***	-0.215***	-0.223***	-0.242***	-0.229***	-0.220***	-0.205***	-0.215***	-0.167***	-0.200***	-0.194***
Johor	-	-	-	-	-	-	-	-	-	-	-
Kedah	-0.277***	-0.240***	-0.298***	-0.270***	-0.254***	-0.298***	-0.291***	-0.275***	-0.257***	-0.324***	-0.264***
Kelantan	-0.316***	-0.321***	-0.344***	-0.357***	-0.358***	-0.357***	-0.335***	-0.299***	-0.253***	-0.304***	-0.266***
Melaka	-0.158***	-0.152***	-0.169***	-0.146***	-0.115***	-0.150***	-0.118***	-0.167***	-0.180***	-0.191***	-0.178***

Negeri Sembilan	-0.089***	-0.066***	-0.083***	-0.098***	-0.021	-0.116***	-0.109***	-0.097***	-0.108***	-0.105***	-0.082***
Pahang	-0.165***	-0.128***	-0.141***	-0.175***	-0.159***	-0.159***	-0.158***	-0.224***	-0.180***	-0.144***	-0.175***
Pulau Pinang	-0.154***	-0.085***	-0.105***	-0.112***	-0.135***	-0.149***	-0.166***	-0.154***	-0.173***	-0.273***	-0.172***
Perak	-0.235***	-0.185***	-0.220***	-0.218***	-0.231***	-0.256***	-0.265***	-0.222***	-0.222***	-0.277***	-0.246***
Perlis	-0.268***	-0.257***	-0.280***	-0.311***	-0.290***	-0.278***	-0.249***	-0.249***	-0.242***	-0.271***	-0.263***
Selangor	-0.041***	-0.008	-0.044***	-0.030***	0.000	-0.038***	-0.048***	-0.044***	-0.062***	-0.085***	-0.038***
Terengganu	-0.273***	-0.209***	-0.286***	-0.307***	-0.288***	-0.312***	-0.308***	-0.260***	-0.236***	-0.275***	-0.239***
Sabah	-0.256***	-0.276***	-0.313***	-0.301***	-0.265***	-0.281***	-0.309***	-0.259***	-0.211***	-0.177***	-0.193***
Sarawak	-0.212***	-0.241***	-0.263***	-0.265***	-0.194***	-0.216***	-0.263***	-0.225***	-0.155***	-0.149***	-0.173***
W.P. Kuala Lumpur	0.017***	0.031**	0.033***	0.040***	0.028**	-0.000	-0.038***	0.011	0.020**	-0.014	0.064***
W.P. Labuan	-0.164***	-0.100**	-0.185***	-0.165***	-0.112***	-0.176***	-0.156***	-0.198***	-0.195***	-0.194***	-0.158***
W.P. Putrajaya	-0.126***	-0.094**	-0.136***	-0.118***	-0.146***	-0.165***	-0.118***	-0.102**	-0.098***	-0.156***	-0.128***
rural	-	-	-	-	-	-	-	-	-	-	-
urban	0.162***	0.129***	0.126***	0.145***	0.147***	0.150***	0.125***	0.113***	0.186***	0.275***	0.238***
Agriculture; forestry and fisheries	-	-	-	-	-	-	-	-	-	-	-
Mining and quarrying	0.482***	0.442***	0.434***	0.408***	0.422***	0.498***	0.464***	0.409***	0.377***	0.559***	0.751***
Manufacturing	0.073***	0.058***	0.097***	0.058***	0.099***	0.067***	0.085***	0.033*	0.056***	0.091***	0.050***
Electricity; gas; steam and air conditioning supply	0.350***	0.354***	0.402***	0.304***	0.289***	0.225***	0.231***	0.221***	0.272***	0.436***	0.681***
Water supply; sewerage waste management and remediation activities	0.074***	0.064*	0.141***	0.048	0.017	0.028	0.035	0.034	0.036	0.184***	0.119***
Construction	0.105***	0.109***	0.150***	0.071***	0.121***	0.067***	0.104***	-0.009	0.080***	0.213***	0.107***
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.024***	0.005	0.074***	0.006	0.027	-0.018	0.034*	-0.025	-0.008	0.049***	0.070***
Transportation and storage	0.158***	0.152***	0.198***	0.132***	0.151***	0.102***	0.176***	0.134***	0.125***	0.203***	0.175***
Accommodation and food service activities	-0.038***	-0.054**	-0.037*	-0.085***	-0.041*	-0.116***	-0.051**	-0.107***	-0.011	0.014	0.023*
Information and communication	0.180***	0.215***	0.201***	0.179***	0.184***	0.101***	0.164***	0.117***	0.134***	0.241***	0.225***

Financial and insurance/takaful activities	0.266***	0.282***	0.315***	0.250***	0.260***	0.230***	0.254***	0.224***	0.231***	0.306***	0.287***
Real estate activities	0.306***	0.214***	0.264***	0.133***	0.268***	0.223***	0.256***	0.248***	0.243***	0.438***	0.573***
Professional; scientific and technical activities	0.162***	0.087***	0.157***	0.085***	0.108***	0.095***	0.136***	0.079***	0.130***	0.249***	0.378***
Administrative and support service activities	-0.057***	-0.023	-0.041*	-0.136***	-0.074***	-0.135***	-0.071***	-0.128***	-0.084***	0.026*	0.020
Public administration and defence; compulsory social security	0.422***	0.394***	0.477***	0.404***	0.470***	0.444***	0.458***	0.351***	0.368***	0.388***	0.447***
Education	0.230***	0.271***	0.195***	0.179***	0.205***	0.183***	0.204***	0.164***	0.243***	0.235***	0.308***
Human health and social work activities	0.280***	0.297***	0.300***	0.257***	0.313***	0.281***	0.288***	0.197***	0.238***	0.293***	0.347***
Arts; entertainment and recreation	0.014	0.020	0.062*	0.013	-0.018	-0.010	0.033	-0.028	-0.049*	0.068***	0.043*
Other service activities	0.019**	0.011	0.061**	-0.029	-0.027	0.011	-0.012	-0.023	-0.007	0.071***	0.090***
Activities of extraterritorial organizations and bodies	0.181***	0.213	0.208	0.407***	0.077	0.261*	-0.340	-0.743	-0.384*	-0.089	-0.088
year=2010	0.000	0.000									
year=2011	-0.006*		0.000								
year=2012	0.016***			0.000							
year=2013	0.065***				0.000						
year=2014	0.100***					0.000					
year=2015	0.120***						0.000				
year=2016	0.132***							0.000			
year=2017	0.172***								0.000		
year=2018	0.234***									0.000	
year=2019	0.290***										0.000
Constant	6.471***	6.008***	6.121***	6.291***	6.331***	6.504***	6.478***	6.804***	6.913***	7.087***	7.352***
Observation	595,912	47,641	50,653	50,139	47,915	47,919	47,284	43,615	84,712	85,283	90,751
R-squared	0.612	0.593	0.604	0.610	0.602	0.620	0.617	0.610	0.583	0.596	0.643

* p<0.05, **p<0.01, ***p<0.001

Citizen average variable values

	Pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Real wage	2,742.35097	2,383.70000	2,337.17111	2,407.89958	2,512.17630	2,647.21226	2,715.42264	2,838.55279	2,965.46804	3,146.33093	3,266.18615
Log of real wage	7.66396	7.51787	7.50963	7.53549	7.58856	7.63581	7.66196	7.69912	7.74361	7.80595	7.86405
Age	35.13804	34.51965	34.63450	34.92484	34.85529	35.17834	35.20893	35.34907	35.44114	35.48622	35.54808
Age squared	1,349.28311	1,303.31674	1,312.31126	1,334.19255	1,329.38154	1,353.12919	1,354.98069	1,363.43556	1,371.21460	1,374.44526	1,379.27458
No formal education	0.00800	0.01097	0.00897	0.01092	0.00796	0.00691	0.00881	0.00759	0.00627	0.00636	0.00628
Primary education	0.06942	0.09005	0.08502	0.08484	0.07345	0.07367	0.06855	0.06310	0.05665	0.05632	0.05115
Secondary education	0.56806	0.58014	0.59012	0.57616	0.58735	0.57094	0.55582	0.55832	0.56097	0.55295	0.55543
Tertiary education	0.35452	0.31884	0.31589	0.32808	0.33124	0.34848	0.36681	0.37099	0.37611	0.38437	0.38714
Managers	0.03542	0.05152	0.04223	0.03768	0.03517	0.03490	0.03419	0.03317	0.03041	0.02778	0.03120
Professionals	0.15895	0.09213	0.13854	0.14338	0.14344	0.14845	0.15700	0.18483	0.18614	0.19024	0.18648
Technician and associate professionals	0.15231	0.20093	0.14921	0.14980	0.14361	0.14428	0.14006	0.14907	0.15142	0.15037	0.15075
Clerical support workers	0.13948	0.15370	0.14522	0.14422	0.14521	0.13703	0.14096	0.12855	0.13574	0.13522	0.13319
Service and sales workers	0.19282	0.16718	0.19080	0.18684	0.20494	0.20771	0.20481	0.19065	0.18837	0.19127	0.19221
Skilled agricultural; forestry and fishery workers	0.00906	0.01397	0.00919	0.00941	0.00996	0.00815	0.00921	0.00762	0.00755	0.00778	0.00870
Craft and related trades workers	0.08902	0.08985	0.09807	0.09739	0.09396	0.09612	0.09216	0.08944	0.08349	0.08058	0.07306
Plant and machine-operators and assemblers	0.13652	0.14517	0.14211	0.13927	0.13496	0.13603	0.12920	0.13228	0.13513	0.13218	0.14058
Elementary occupations	0.08644	0.08554	0.08463	0.09201	0.08875	0.08733	0.09242	0.08437	0.08175	0.08456	0.08382
Female	0.39717	0.37999	0.38694	0.39033	0.39464	0.39580	0.39518	0.40238	0.40634	0.40536	0.40883
Johor	0.12547	0.12783	0.12758	0.12489	0.12956	0.12561	0.12144	0.12335	0.12585	0.12624	0.12328
Kedah	0.05948	0.06286	0.05801	0.05582	0.05767	0.05988	0.06224	0.05968	0.05833	0.06042	0.05988
Kelantan	0.03942	0.03528	0.03775	0.03728	0.03713	0.03752	0.04045	0.04189	0.04173	0.04194	0.04175
Melaka	0.03070	0.03177	0.03072	0.03060	0.03098	0.03039	0.02243	0.03220	0.03276	0.03239	0.03257
N Sembilan	0.03424	0.03281	0.03503	0.03440	0.03394	0.03349	0.03301	0.03500	0.03494	0.03529	0.03425

Pahang	0.04651	0.04408	0.04555	0.04476	0.04281	0.04662	0.06076	0.04446	0.04450	0.04487	0.04618
P Pinang	0.06646	0.07013	0.06915	0.06755	0.06695	0.06590	0.06663	0.06597	0.06518	0.06463	0.06380
Perak	0.07654	0.07633	0.07793	0.07513	0.07462	0.07683	0.07828	0.07691	0.07597	0.07718	0.07611
Perlis	0.00682	0.00649	0.00625	0.00639	0.00635	0.00671	0.00674	0.00738	0.00708	0.00706	0.00755
Selangor	0.24554	0.24244	0.24178	0.25040	0.24711	0.24533	0.23744	0.24252	0.24753	0.24580	0.25379
Terengganu	0.03213	0.03152	0.03258	0.03188	0.03085	0.03109	0.03199	0.03234	0.03284	0.03253	0.03335
Sabah	0.07558	0.07049	0.07350	0.07488	0.07703	0.07691	0.07744	0.07855	0.07539	0.07593	0.07487
Sarawak	0.08266	0.08100	0.07934	0.08169	0.07999	0.08304	0.08349	0.08382	0.08399	0.08480	0.08436
KL	0.07056	0.07808	0.07605	0.07579	0.07677	0.07260	0.06989	0.06829	0.06682	0.06360	0.06143
Labuan	0.00364	0.00391	0.00383	0.00385	0.00375	0.00374	0.00366	0.00363	0.00331	0.00355	0.00331
Putrajaya	0.00423	0.00498	0.00495	0.00468	0.00448	0.00435	0.00412	0.00400	0.00378	0.00379	0.00349
Urban	0.81043	0.76242	0.76195	0.77475	0.78481	0.82660	0.81307	0.82676	0.84105	0.84260	0.84857
Agriculture; forestry and fisheries	0.02642	0.03122	0.02371	0.02599	0.02943	0.02831	0.02949	0.02523	0.02278	0.02474	0.02435
Mining and quarrying	0.00932	0.00733	0.00825	0.00925	0.00863	0.00841	0.01120	0.01185	0.00952	0.00936	0.00895
Manufacturing	0.19215	0.20707	0.21046	0.20489	0.18952	0.19278	0.18135	0.18488	0.19068	0.18149	0.18426
Electricity; gas; steam and air conditioning supply	0.00724	0.00658	0.00640	0.00778	0.00618	0.00754	0.00613	0.00938	0.00691	0.00759	0.00763
Water supply; sewerage waste management and remediation activities	0.00745	0.00764	0.00712	0.00767	0.00821	0.00799	0.00642	0.00729	0.00737	0.00778	0.00708
Construction	0.07995	0.08151	0.08373	0.08041	0.08104	0.08247	0.08097	0.08069	0.07865	0.07720	0.07423
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.16453	0.15429	0.16114	0.16209	0.16776	0.16670	0.16442	0.16635	0.16747	0.16464	0.16819
Transportation and storage	0.05567	0.05683	0.05506	0.05686	0.05446	0.05345	0.05553	0.05451	0.05582	0.05790	0.05629
Accommodation and food service activities	0.06314	0.05542	0.05573	0.05953	0.05788	0.06125	0.06262	0.06401	0.06726	0.07089	0.07301
Information and communication	0.02128	0.01992	0.02077	0.02333	0.02023	0.02279	0.02182	0.02043	0.02191	0.02107	0.02043
Financial and insurance/takaful activities	0.03526	0.03862	0.03637	0.03648	0.03513	0.03213	0.03677	0.03344	0.03678	0.03291	0.03480

Real estate activities	0.00698	0.00587	0.00532	0.00603	0.00733	0.00696	0.00641	0.00674	0.00767	0.00877	0.00808
Professional; scientific and technical activities	0.03260	0.03085	0.03530	0.03246	0.03198	0.03070	0.03339	0.03195	0.03116	0.03318	0.03480
Administrative and support service activities	0.05045	0.03228	0.04311	0.04515	0.04771	0.05368	0.05406	0.05245	0.05379	0.05704	0.06001
Public administration and defence; compulsory social security	0.08824	0.10894	0.09401	0.08644	0.09686	0.08797	0.08855	0.08540	0.08321	0.07923	0.07734
Education	0.09781	0.09890	0.09504	0.09419	0.09528	0.09709	0.10144	0.09940	0.09345	0.10399	0.09864
Human health and social work activities	0.03905	0.03306	0.03591	0.03814	0.03862	0.03628	0.03891	0.04321	0.04336	0.04069	0.04068
Arts; entertainment and recreation	0.00803	0.00920	0.00877	0.00840	0.00935	0.00831	0.00695	0.00920	0.00705	0.00721	0.00643
Other service activities	0.01432	0.01430	0.01371	0.01467	0.01430	0.01485	0.01356	0.01358	0.01508	0.01424	0.01477
Activities of extraterritorial organizations and bodies	0.00012	0.00017	0.00010	0.00026	0.00011	0.00033	0.00001	0.00002	0.00008	0.00010	0.00002
year=2010	0.08690	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2011	0.09279	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2012	0.09460	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2013	0.09607	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2014	0.10201	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2015	0.10148	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000
year=2016	0.10240	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000
year=2017	0.10547	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000
year=2018	0.10650	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000
year=2019	0.11177	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000
year=2020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Non-citizen average variable values

	Pooled	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Real wage	1,503.81333	1,203.98087	1,151.28150	1,274.51863	1,421.31968	1,459.81827	1,640.15632	1,621.41022	1,616.92647	1,634.46821	1,788.25719
Log of real wage	7.10540	6.85517	6.85027	6.92897	7.02749	7.07020	7.14193	7.20006	7.23770	7.24484	7.32094

Age	30.20311	30.04764	30.16513	30.24564	30.17722	30.17859	30.45936	30.17446	30.05413	30.10586	30.37649
Age squared	989.56690	976.96341	987.03932	991.46049	993.65545	989.00160	1,007.41396	987.65123	978.73601	979.13606	1,001.04643
No formal education	0.08851	0.08553	0.09186	0.08529	0.07501	0.07791	0.08978	0.08760	0.08529	0.09760	0.10772
Primary education	0.43220	0.44833	0.44800	0.45217	0.46965	0.44468	0.47437	0.41874	0.41199	0.39567	0.37266
Secondary education	0.42584	0.42249	0.41324	0.40673	0.40453	0.43334	0.37332	0.43823	0.44977	0.45250	0.45563
Tertiary education	0.05345	0.04365	0.04690	0.05581	0.05081	0.04407	0.06253	0.05543	0.05294	0.05424	0.06399
Managers	0.00672	0.00846	0.00528	0.00622	0.00480	0.00514	0.01159	0.00410	0.00694	0.00794	0.00653
Professionals	0.01838	0.01035	0.01132	0.01305	0.01618	0.01451	0.02409	0.02252	0.02191	0.02109	0.02337
Technician and associate professionals	0.01874	0.01954	0.02623	0.01633	0.01915	0.01209	0.01623	0.01325	0.01859	0.02165	0.02583
Clerical support workers	0.01089	0.01801	0.00843	0.01006	0.00643	0.01126	0.00979	0.01476	0.01063	0.00951	0.01103
Service and sales workers	0.15541	0.12082	0.15013	0.17583	0.13481	0.17228	0.12834	0.16821	0.15624	0.16763	0.17280
Skilled agricultural; forestry and fishery workers	0.04430	0.25580	0.04264	0.04598	0.04087	0.02227	0.02036	0.02113	0.01964	0.01749	0.01682
Craft and related trades workers	0.12242	0.11551	0.14256	0.14757	0.13597	0.12867	0.11786	0.13451	0.09588	0.10916	0.10694
Plant and machine-operators and assemblers	0.22442	0.21469	0.23527	0.24132	0.26446	0.19318	0.18781	0.19099	0.23755	0.25519	0.23008
Elementary occupations	0.39871	0.23682	0.37813	0.34365	0.37733	0.44060	0.48392	0.43053	0.43262	0.39033	0.40660
Female	0.21090	0.20326	0.18918	0.18353	0.18832	0.23035	0.19619	0.21541	0.22815	0.22084	0.23901
Johor	0.10631	0.13607	0.13005	0.11802	0.10835	0.09459	0.09043	0.10150	0.10020	0.09613	0.10469
Kedah	0.03099	0.02719	0.03474	0.03140	0.03021	0.03173	0.03252	0.02699	0.03008	0.03191	0.03295
Kelantan	0.00827	0.00794	0.00646	0.00587	0.00823	0.00616	0.00987	0.00894	0.00992	0.00916	0.00900
Melaka	0.01619	0.01560	0.01702	0.01544	0.01551	0.01686	0.01260	0.01527	0.01671	0.01908	0.01773
N Sembilan	0.02707	0.02468	0.02441	0.03023	0.02926	0.02592	0.02363	0.02622	0.02711	0.03065	0.02820
Pahang	0.04149	0.04331	0.04017	0.04235	0.04070	0.03961	0.06102	0.03722	0.03380	0.03763	0.03917
P Pinang	0.05575	0.05003	0.04893	0.05288	0.05587	0.06216	0.05533	0.05829	0.05653	0.05846	0.05529
Perak	0.03354	0.04007	0.03487	0.03829	0.03303	0.03797	0.02799	0.03184	0.03105	0.03417	0.02945
Perlis	0.00102	0.00190	0.00163	0.00052	0.00148	0.00081	0.00023	0.00097	0.00112	0.00060	0.00123
Selangor	0.21718	0.18058	0.22385	0.22954	0.23147	0.21040	0.20539	0.22598	0.21903	0.23455	0.20650
Terengganu	0.00839	0.00912	0.01076	0.00856	0.01071	0.00681	0.00718	0.00761	0.00777	0.00799	0.00835

Sabah	0.31975	0.32944	0.30085	0.29541	0.30226	0.32748	0.34152	0.32720	0.32541	0.30738	0.33166
Sarawak	0.07822	0.07651	0.07065	0.06902	0.07290	0.08497	0.07624	0.08394	0.08275	0.08118	0.07949
KL	0.05315	0.05458	0.05228	0.05942	0.05737	0.05238	0.05298	0.04620	0.05585	0.04798	0.05400
Labuan	0.00201	0.00239	0.00265	0.00237	0.00202	0.00169	0.00194	0.00182	0.00193	0.00211	0.00151
Putrajaya	0.00068	0.00059	0.00068	0.00069	0.00064	0.00047	0.00114	0.00000	0.00075	0.00103	0.00078
Urban	0.66094	0.58016	0.66570	0.73601	0.70156	0.62866	0.59970	0.63473	0.65655	0.70593	0.69947
Agriculture; forestry and fisheries	0.27739	0.31608	0.23054	0.20641	0.22693	0.31087	0.36465	0.29594	0.29702	0.25461	0.24916
Mining and quarrying	0.00403	0.00219	0.00448	0.00624	0.00792	0.00310	0.00296	0.00119	0.00622	0.00338	0.00278
Manufacturing	0.27023	0.25817	0.30590	0.29427	0.30728	0.21731	0.21366	0.25459	0.26502	0.29948	0.30087
Electricity; gas; steam and air conditioning supply	0.00074	0.00401	0.00052	0.00000	0.00068	0.00000	0.00000	0.00060	0.00068	0.00068	0.00095
Water supply; sewerage waste management and remediation activities	0.00420	0.00897	0.00670	0.00376	0.00146	0.00242	0.00526	0.00273	0.00511	0.00345	0.00362
Construction	0.15870	0.15499	0.18560	0.18154	0.18514	0.16214	0.16411	0.14406	0.14242	0.13735	0.14168
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.09100	0.08123	0.09547	0.10319	0.10239	0.10508	0.07430	0.09633	0.08603	0.08399	0.08433
Transportation and storage	0.01393	0.01530	0.01609	0.02369	0.01787	0.01161	0.01067	0.01762	0.01181	0.00936	0.00870
Accommodation and food service activities	0.09189	0.07417	0.08610	0.06846	0.08120	0.09938	0.08021	0.09650	0.09571	0.11721	0.10849
Information and communication	0.00629	0.00151	0.00268	0.00211	0.00373	0.00425	0.00975	0.00812	0.00567	0.01067	0.01116
Financial and insurance/takaful activities	0.00244	0.00075	0.00000	0.00192	0.00126	0.00135	0.00462	0.00250	0.00343	0.00241	0.00484
Real estate activities	0.00105	0.00106	0.00051	0.00309	0.00107	0.00092	0.00049	0.00076	0.00107	0.00086	0.00094
Professional; scientific and technical activities	0.00509	0.00856	0.00559	0.00256	0.00361	0.00191	0.00466	0.00962	0.00623	0.00419	0.00441
Administrative and support service activities	0.05138	0.04561	0.03867	0.07314	0.04443	0.06110	0.04812	0.04748	0.04972	0.05005	0.05521
Public administration and defence; compulsory social security	0.00063	0.00238	0.00115	0.00067	0.00077	0.00142	0.00009	0.00000	0.00000	0.00023	0.00029

Education	0.00576	0.00897	0.00355	0.00462	0.00553	0.00578	0.00616	0.00637	0.00595	0.00446	0.00629
Human health and social work activities	0.00367	0.00166	0.00380	0.00471	0.00384	0.00197	0.00427	0.00301	0.00579	0.00298	0.00422
Arts; entertainment and recreation	0.00422	0.00199	0.00428	0.01100	0.00019	0.00643	0.00175	0.00475	0.00496	0.00387	0.00357
Other service activities	0.00682	0.01149	0.00837	0.00792	0.00353	0.00296	0.00378	0.00716	0.00669	0.01009	0.00803
Activities of extraterritorial organizations and bodies	0.00055	0.00092	0.00000	0.00070	0.00116	0.00000	0.00048	0.00066	0.00047	0.00067	0.00046
year=2010	0.07784	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2011	0.08301	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2012	0.08509	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2013	0.10073	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2014	0.10790	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000	0.00000
year=2015	0.11083	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000
year=2016	0.10653	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000
year=2017	0.11316	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000
year=2018	0.10664	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000
year=2019	0.10827	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000
year=2020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Appendix 9: Median nominal wage by decile across subgroups

Education

	2012			2016			2018		
Decile	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
1	393	500	845	600	760	1,025	631	857	1,218
2	500	700	1,425	800	900	1,615	905	1,089	1,826
3	600	845	1,800	900	1,045	2,150	1,049	1,259	2,369
4	705	1,000	2,117	995	1,200	2,565	1,159	1,457	2,757
5	800	1,200	2,500	1,139	1,475	3,070	1,300	1,655	3,324
6	900	1,384	3,000	1,238	1,665	3,648	1,466	1,873	3,963
7	1,000	1,575	3,348	1,415	1,925	4,330	1,629	2,200	4,834
8	1,200	1,950	3,955	1,504	2,322	5,000	1,823	2,504	5,777
9	1,500	2,448	4,881	1,761	2,847	6,000	2,167	3,237	7,122
10	2,000	3,300	7,100	2,500	4,000	9,145	2,811	4,608	10,583

Age

	2012			2016			2018		
Decile	15-24	25-54	55-64	15-24	25-54	55-64	15-24	25-54	55-64
1	400	565	484	600	800	775	771	900	915
2	515	800	700	800	1,000	975	1,025	1,174	1,249
3	650	1,000	875	900	1,273	1,213	1,153	1,457	1,602
4	770	1,200	1,075	950	1,575	1,600	1,262	1,733	1,935
5	860	1,500	1,300	1,075	1,800	1,975	1,426	2,133	2,335
6	990	1,800	1,677	1,200	2,217	2,500	1,590	2,449	3,043
7	1,106	2,145	2,000	1,410	2,650	3,045	1,751	2,976	3,743
8	1,300	2,669	2,793	1,631	3,312	4,075	1,946	3,786	4,891
9	1,609	3,450	3,760	1,850	4,505	5,318	2,294	5,101	6,566
10	2,400	5,000	6,000	2,650	6,250	9,115	3,130	7,597	10,819

Sector

Year	Decile	Sector							
		Agriculture, forestry and fisheries	Mining and quarrying	Manufacturing	Construction	Modern services	Social services	Utilities	Other, traditional services
2012	1	1,216	675	510	500	915	800	595	460
	2	1,256	813	700	725	1,275	1,440	800	600
	3	1,311	1,200	850	865	1,555	1,712	1,100	775
	4	1,364	1,500	1,000	1,000	2,000	1,998	1,350	900
	5	1,406	2,000	1,195	1,175	2,200	2,379	1,575	1,000
	6	1,461	2,600	1,376	1,290	2,500	2,720	1,855	1,200
	7	1,510	3,500	1,615	1,500	3,000	3,125	2,200	1,500
	8	1,606	4,600	2,000	1,800	3,500	3,531	2,550	1,770
	9	1,756	5,750	2,750	2,475	4,650	4,115	3,453	2,250
	10	2,012	10,000	4,500	3,800	7,500	5,412	4,500	3,300
2016	1	1,308	1,200	855	755	1,200	1,050	900	675
	2	1,408	1,640	955	910	1,650	1,851	1,188	890
	3	1,458	1,950	1,136	1,113	2,050	2,297	1,413	955
	4	1,508	2,500	1,286	1,275	2,500	2,655	1,652	1,100
	5	1,608	3,275	1,500	1,455	3,000	3,110	2,000	1,300
	6	1,658	3,950	1,732	1,630	3,400	3,648	2,500	1,600
	7	1,738	4,810	2,000	1,910	4,000	4,138	3,000	1,742
	8	1,783	5,600	2,500	2,150	5,000	4,810	3,460	2,050
	9	1,990	7,825	3,150	2,960	6,000	5,468	4,355	2,683
	10	2,026	14,500	5,000	5,085	10,350	7,350	6,000	4,250
2018	1	1,373	996	971	1,014	1,473	1,193	1,092	743
	2	1,451	1,592	1,146	1,223	1,990	2,205	1,464	1,036
	3	1,502	2,121	1,316	1,446	2,447	2,523	1,763	1,184

	4	1,564	2,563	1,476	1,633	2,783	2,956	2,137	1,371
	5	1,628	3,335	1,633	1,783	3,209	3,512	2,417	1,600
	6	1,709	4,099	1,836	2,115	3,853	3,969	2,882	1,829
	7	1,779	5,204	2,244	2,375	4,679	4,730	3,389	2,085
	8	1,865	6,676	2,548	2,724	5,745	5,545	3,993	2,394
	9	2,018	9,167	3,493	3,758	7,323	6,591	5,294	3,145
	10	2,363	15,609	5,656	6,465	12,326	8,853	7,700	5,029

Gender

	2012		2016		2018	
Decile	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
1	523	465	800	630	921	790
2	760	640	990	900	1,168	1,078
3	900	800	1,200	1,050	1,399	1,294
4	1,078	1,000	1,425	1,260	1,636	1,545
5	1,300	1,300	1,645	1,600	1,890	1,843
6	1,500	1,575	1,968	2,000	2,262	2,281
7	1,929	2,000	2,450	2,485	2,594	2,731
8	2,450	2,500	3,000	3,125	3,361	3,609
9	3,044	3,195	4,000	4,360	4,575	4,898
10	5,000	4,500	6,200	5,760	7,405	7,062

Citizenship

Decile	2012		2016		2018	
	Citizen	Non-citizens	Citizen	Non-citizens	Citizen	Non-citizens
1	525	400	800	650	947	605
2	795	525	990	835	1,203	910
3	1,000	650	1,213	900	1,491	1,074
4	1,200	751	1,575	1,000	1,785	1,194
5	1,500	805	1,800	1,195	2,161	1,341
6	1,800	905	2,212	1,251	2,470	1,470
7	2,070	1,000	2,650	1,455	3,008	1,615
8	2,599	1,175	3,313	1,600	3,794	1,762
9	3,370	1,310	4,445	1,752	5,108	2,025
10	5,000	1,800	6,250	2,700	7,623	2,765

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