

A multidimensional employment quality index for Brazil, 2002–11

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Abstract. *In countries where informal, insecure jobs are widespread, traditional labour market indicators – such as the unemployment rate, labour force participation rate and wages – are not necessarily the most meaningful. The authors use a multidimensional employment quality index to analyse the Brazilian labour market over the period 2002–11, across three dimensions: earnings, formality (measured by the existence of an employment contract and social security contributions) and job tenure. The results show a significant increase in employment quality overall, especially in the years 2009–11, but with considerable differences between wage employees and self-employed workers, and between industries.*

In the absence of a consensus on how to measure the level of well-being generated by the labour market, quantitative labour market indicators are generally used, such as the unemployment rate. In recent decades, the International Labour Organization (ILO) – through its concept of “decent work” – and the European Union (EU) have endeavoured to bring the issue of employment quality to the fore of international debate. However, these issues are rarely addressed in the academic literature, unlike other innovative concepts, such as the Human Development Index.¹

One possible explanation lies in the considerable challenges faced in the measurement of employment quality, such as limited availability of data and limited comparability between countries. Some of these challenges have been addressed in the literature on multidimensional poverty. Like poverty, employment

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¹ For more details, see Burchell, Sehnbruch, Piasna and Agloni (2012) and Burchell, Sehnbruch, Agloni and Piasna (2013).

quality consists of a number of important dimensions; it is therefore possible to extend the progress made in measuring multidimensional poverty to measuring employment quality. Huneus, Landerretche and Puentes (2012) proposed the first multidimensional employment quality index, using the multidimensional poverty methodology. In this article, we build on that work, to develop a multidimensional employment quality index for Brazil, covering the period 2002–11.

Brazil provides an interesting context in which to measure employment quality, for three reasons. First, Brazilian workers are protected by legislation. Second, there is ongoing concern about employment insecurity (high levels of informality, job rotation, unemployment and low wages). Third, the period 2002–11 saw the implementation of a number of public and economic policies that may have had a large impact on the labour market.

In Brazil, workers who have a formal relationship with their employer have access to the benefits established in the Labour Code, once their work and social security card issued by the Labour Ministry has been signed or stamped.² Social security contributions for wage employees are based on individual earnings and are split between the worker (8–11 per cent) and the employer (20 per cent).³ In addition, employers are required to contribute 8 per cent of workers' wages each month to the Guarantee Fund for Wage Employees. If a wage employee is dismissed without just cause (defined by law) the employer must pay the Fund 40 per cent of the total amount deposited in the course of the wage employee's employment. This money is available to the wage employee in the event of unemployment or ill health, or to buy a home. Self-employed workers must make social security contributions corresponding to at least 11 per cent of the minimum wage established by law, and can then access the same benefits as wage employees (Ministry of Social Security, 2008).⁴

In the period 2002–11, particularly from 2006 onwards, a number of reforms were implemented in Brazil to promote formal employment, boost economic growth and assist the most vulnerable population groups. The first half of the period was marked by the increase from 2003 in the price of basic commodities (oil, sugar, coffee, corn and soybeans) and the implementation of the *Bolsa Família* programme, which gives cash benefits to low-income families in exchange for complying with child health and education requirements. In 2006, tax incentives were introduced to promote the formalization of domestic work.⁵ In 2007 – a year marked by the discovery of an oil field off the Brazil-

² The benefits include a thirteenth salary, 30 days of paid leave, compensation for unfair dismissal, "time and a half" paid for every hour over 44 hours, and a food and transport allowance (Botelho and Ponczek, 2011).

³ Employer contributions may vary depending on firm size or industry. For example, employers of domestic workers contribute 12 per cent of their wages.

⁴ Social security benefits include: old-age or disability pension; contributory pension (allowing for early retirement); cash benefits in the event of accident or ill health; four months' paid maternity leave; survivor pension; and cash benefits in the event of the insured's imprisonment. The only benefit not automatically available to self-employed workers is the contributory pension, although they may opt for this if they pay a higher rate (20 per cent).

⁵ Employers may deduct contributions paid in respect of domestic workers from their taxes.

ian coast – the Growth Acceleration Programme was implemented,⁶ and tax arrangements for microenterprises and small businesses were simplified under the Microenterprise and Small Business Act of 2006 (known as the *Super Simples* Act).⁷ In addition, the Simplified Social Protection Plan was created to encourage more self-employed workers to make social security contributions.⁸ In 2008, the Plan was amended to encourage rural workers to contribute, and in 2009 the Individual Microentrepreneurs Act entered into force, which states that microenterprises with annual earnings below 36,000 reais (US\$16,500)⁹ that pay social security contributions are exempt from tax (Ter-Minassian, 2012; Ministry of Social Security, 2008).¹⁰

In addition, in response to the onset of the global economic crisis in 2007, the Brazilian Government implemented a broad package of measures including: a 5 per cent drop in the interest rate between 2008 and 2009; increased access to National Development Bank business loans; investment in infrastructure through the federal housing programme *Minha Casa, Minha Vida* in 2009 and a second Accelerated Growth Programme in 2010; reduction of income tax, real estate tax and tax on specific goods (cars, household appliances, building materials, wheat, flour and bread); extension of unemployment insurance; and extension of the coverage and benefits of the Bolsa Família programme (ILO, 2010). Lastly, between 2000 and 2011 the minimum wage adjustment policy was amended, resulting in an 80 per cent increase in the minimum wage, in real terms, over the 11-year period.

With these measures in place, Brazil was showing considerable improvement by 2011: the poverty rate had fallen from 40 per cent (2002) to 20 per cent, the Gini coefficient had fallen from 0.63 (2002) to 0.55, and unemployment had fallen by half, to 6 per cent. The level of informal employment had decreased: between 2006 and 2011, the number of workers contributing to the social security system rose by 8.5 per cent, more than twice the increase observed between 1992 and 2006. Meanwhile, GDP growth – although interrupted by the economic crisis in 2009 – rose at an average annual rate of 4 per cent in the period 2002–11.¹¹

⁶ The *Programa de Aceleração do Crescimento* is an investment/tax incentive programme to improve infrastructure in the areas of housing, energy, transport, oil, mining and utilities.

⁷ *Lei Geral da micro e pequena empresa*, established by the *Lei Complementar Federal* 123/2006. For more information, see <http://www.leigeral.com.br/portal/main.jsp?lumPageId=FF8081812658D379012665B59AC01CE8>.

⁸ The *Plano Simplificado de Inclusão Previdenciária*, established by the *Lei Complementar Federal* 123/2006 and implemented in April 2007, provides that self-employed workers making social security contributions shall have access to all the benefits of the social security system. For more information, see <http://www.previdencia.gov.br/plano-simplificado-de-previdencia-social-psps>.

⁹ 2013 value.

¹⁰ *Lei Complementar Federal* 128/2008. For more information, see <http://www.portaldoempreendedor.gov.br/perguntas-frequentes/duvidas-relacionadas-ao-microempreendedor-individual/o-microempreendedor-individual-mei>.

¹¹ According to CEPALSTAT data (http://estadisticas.cepal.org/cepalstat/WEB_CEPALSTAT/Portada.asp) and the World Bank collection of World Development Indicators (<http://data.worldbank.org/data-catalog/world-development-indicators>).

To evaluate the effect of all these changes on employment quality in Brazil, we develop in this article a multidimensional employment quality index, which simultaneously considers three dimensions: earnings, formality (measured by the existence of an employment contract and social security contributions) and job tenure. We also perform a multivariate analysis of employment quality. For this, we use data from the Brazilian National Household Survey Sample carried out by the Brazilian Institute of Geography and Statistics for the period 2002–11. The results show that there was an overall increase in employment quality over the entire period, but particularly from 2007 onwards, and especially between 2009 and 2011, which was precisely when major economic reforms were introduced and formalization of employment promoted. Important differences were observed between the employment quality of wage employees and that of the self-employed, as well as a relatively larger increase in employment quality for initially vulnerable groups (domestic workers and own-account workers). Multivariate analysis suggests that the following factors are systematically correlated with better employment quality: trade union membership, being employed in the public sector, and working in the manufacturing, utilities, oil extraction or financial industries.

The remainder of this article is divided into four sections. The first describes the proposed index for measuring employment quality. The second section provides a descriptive analysis of the data, and the results. The third describes the multivariate analysis and the fourth section sets out the conclusions.

Multidimensional employment quality index

In the same way as poverty, employment quality can best be measured using a number of different dimensions; in addition, there is an economic relationship between the two phenomena. While there is an extensive literature on poverty, from Amartya Sen's notion of "capabilities" to the multidimensional poverty measures proposed by Streeten (1981), Atkinson (2003), Bourguignon and Chakravarty (2003), and Alkire and Foster (2011), little research has been done on the measurement of employment quality.¹² This article therefore describes the second application of the multidimensional index we developed in 2012.

Following on from Huneus, Landerretche and Puentes (2012), we use the FGT class of decomposable poverty measures developed and subsequently reviewed by Foster, Greer and Thorbecke (1984 and 2010), and by Alkire and Foster (2009 and 2011). The FGT methodology constituted one of the first, and most simple and intuitive multidimensional poverty measures, and has seen a large number of applications. The methodology is also appropriate for measuring employment quality, given its multidimensional nature, although the dimensions considered will be different. In addition, the multidimensional index has been tested and validated by the literature on multidimensional poverty for nearly 30 years.

¹² In this issue of the *International Labour Review*, Farné and Vergara propose another employment quality indicator, based on Categorical Principal Components Analysis (CATPCA), for Colombia.

Our approach will be to measure deprivations in the area of employment quality, and construct an index that is easy to implement and allows available data to be disaggregated by specific job-related characteristics and processed as intensively as possible (we use cardinal and ordinal variables).

Two thresholds are used. The first is a threshold within each dimension, to determine whether a person is deprived in that dimension (e.g. a person is deprived of earnings if they earn less than the minimum wage). The second is the threshold k , which corresponds to the number of deprivations required to qualify employment as being of low quality. More information is provided in the subsection “Thresholds” below.

The multidimensional index takes the following form:

$$M_{0t}(k) = \left(\sum_{i=1}^n c_{it}(k) \right) / nd$$

where d is the total number of employment quality dimensions considered (in this case there are three), n is the number of workers in the sample, and $c_{it} = \sum_{j=1}^d g_{jit} 1(\sum_{j=1}^d g_{jit} > k)$ is the number of deprivations of worker i at time t . In this expression, g_{jit} is equal to 1 if worker i suffers a deprivation in dimension j at time t , and 0 otherwise. If the number of deprivations (c_{it}) is higher than k , then worker i will have low employment quality at time t , and if c_{it} is lower than k , then the employment will be considered to be of good-quality and the number of deprivations of this worker will not be considered when calculating the numerator in the index $M_{0t}(k)$. In other words, c_{it} is a censored variable since, depending on the value of k , workers who have good-quality jobs will be considered to have zero deprivations (Alkire and Foster, 2009).

The $M_{0t}(k)$ index is thus defined as the number of deprivations, given threshold k , suffered by a subset of workers with low-quality employment, at time t , divided by the total possible number of deprivations (nd). Therefore, $M_{0t}(k)$ will have a value between 0 and 1; the closer it is to 1, the worse the employment quality will be. For example, if the index is equal to 0.3, it means that workers with low employment quality suffer 30 per cent of all possible deprivations.

The advantages of an FGT index are highlighted by its authors (Foster, Greer and Thorbecke, 2010): it has a simple structure, its axiomatic properties are sound and it can be easily and intuitively decomposed by population subgroup and by dimension. It should be borne in mind, however, that the dimensions of the index will have some degree of complementarity – i.e. they will to some extent be positively correlated. If there were a high degree of substitution, aggregating the dimensions in the same index would be pointless, since information would be lost rather than synthesized.

There are four main steps involved when defining this type of index. First, the decision whether to use household data (supply) or business data (demand); we use household data. Second, in order to identify workers with low employment quality, it is necessary to define the dimensions considered, the thresholds for each dimension, and the threshold k described above. Third, a method for weighting the different dimensions would normally be selected.

Owing to limited data availability, however, we do not perform this last step, and all dimensions are given the same weight; in other words, we assume that the dimensions have a similar effect on workers' well-being.¹³ Fourth, a method for aggregation across individuals must be chosen, to assign a value to employment quality at time t . For this, we use the $M_{0t}(k)$ index.

Dimensions

The main limitation in the selection of dimensions is the availability of data. We use three dimensions: (i) earnings; (ii) formality – measured by the existence of an employment contract and social security contributions; and (iii) job tenure. The criteria will be similar to those used in Huneus, Landerretche and Puentes (2012) for Chile, but without the dimension of job training used in that study.

Of the four strategic objectives of the ILO's Decent Work Agenda, "guaranteeing rights at work" and "extending social protection" are closely related to the dimensions used in our proposed index.¹⁴ The dimensions corresponding to "promoting social dialogue" and "promoting jobs" are not incorporated, owing to lack of data. We also use two of the four dimensions of employment quality defined by Davoine, Erhel and Guergoat-Larivière (2008a): socio-economic security and working conditions.¹⁵ It would be useful for future research to incorporate the ILO and EU dimensions we have not included, when data are available.

Thresholds

With regard to the thresholds used within each dimension to identify deprivations, workers are considered to suffer a deprivation in the dimension "earnings" if they earn less than the minimum national hourly wage. In the dimension "formality", wage employees are considered to suffer a deprivation if they have no contract and make no social security contributions, and self-employed workers if they make no social security contributions. In the dimension "job tenure", workers are considered to suffer a deprivation if they have been in their job for less than a year.¹⁶

¹³ In Huneus, Landerretche and Puentes (2012) different weightings are estimated for each dimension, since subjective data on workers' assessment of employment quality are available.

¹⁴ See <http://www.ilo.org/global/about-the-ilo/decent-work-agenda/lang-en/index.htm> [accessed 20 April 2015].

¹⁵ In their concept of employment quality, based on the academic and institutional literature on the subject, these authors also add the dimensions "skills and training" and "ability to combine work and family life, and promotion of gender equality" (see Davoine, Erhel and Guergoat-Larivière, 2008a and 2008b). These dimensions are similar to those defined by the European Foundation for the Improvement of Living and Working Conditions (2002), and also take into account the conceptual framework of the European Union (European Commission, 2001).

¹⁶ Workers are eligible for unemployment insurance after six months; if the worker was employed for 12 months or more, the benefit is paid for longer. The same threshold is used by the ILO in the analysis of employment stability (ILO, 2009). Available at: http://www.ilo.org/integration/resources/pubs/WCMS_124376/lang-en/index.htm.

These thresholds were chosen in order to ensure international comparability and local relevance. The first threshold corresponds to the general, objective principle that workers should enjoy the minimum purchasing power deemed necessary by society. The second threshold reflects the fact that jobs with contracts and/or social security coverage are more secure, and the third reflects workers' greater job stability after a year in the same job, when they become eligible for statutory benefits such as 30 days of paid vacation, higher hourly wages or a thirteenth salary. In addition, after more than 12 months of social security contributions, workers have access to social benefits such as disability or health insurance, and better unemployment insurance.

The k threshold, which indicates the number of deprivations that will determine if employment is of poor quality, will not be defined a priori: instead, the indices will be constructed around three possibilities, i.e. that a job is of low quality when there are deprivations in 1, 2 or 3 dimensions. Each index will be analysed separately.

Data set and index results

Data set

We used data from the National Household Survey Sample conducted by the Brazilian Institute of Geography and Statistics for 2002–11. We exclude 2010, since that year a population census was carried out instead of the survey. Through this annual, nationally representative survey, data are collected on the family composition, housing, education, employment and earnings of members of private households in Brazil, and are used to calculate the official employment statistics.

Wage employees and the self-employed are included in our sample, but not those with unpaid work or whose main activity is own-use production, since these workers answer only a subset of the survey's questions on employment, and have no labour income. Other employment quality studies have focused exclusively on wage employees, since the absence of a contract means that self-employed workers cannot access the same employment/social security benefits. In this study, we include self-employed workers, since under Brazil's legislation the self-employed have access to the same social security benefits as employees. The two groups are analysed separately, however, since they have very different characteristics.

In Brazil, the legal minimum working age is 16 years. However, those aged between 16 and 22, men aged 65 and women aged 60 are not included in the analysis, in order to isolate the effects of decisions to study or retire.¹⁷ Thus, each year, an average of 21,596 wage employees and 6,879 self-employed

¹⁷ Employment quality for workers aged 16–22, men aged 65 and women aged 60 is much lower than that observed for the rest of the labour force. However, study and retirement decisions interfere with the interpretation of the data, since people who decide to work at these stages of life could have specific individual characteristics that determine the quality of the jobs they take up.

workers were excluded from the analysis. Lastly, the data set used contains on average, for each of the nine years analysed, information on 94,300 wage employees and 40,190 self-employed workers, representing a total of 45 million and 19 million workers, respectively.

Table A1 in the Appendix provides the sample's descriptive statistics, disaggregated by wage employees and self-employed workers. The data are shown for the years 2002 and 2011, indicating whether the variation between the two years is statistically significant. Considerable differences can be seen between wage employees and the self-employed. For example, self-employed workers are mostly men, live in rural areas, in the north of the country, and work in agriculture, trade or construction. Wage employees are better educated and work mostly in finance, social services or public administration. In addition, over the period 2002–11, significant changes occurred, for both wage employees and the self-employed: the proportion of women increased, as well as that of non-white workers; the age of entry into the labour market and the length of education both increased. The proportion of workers in the manufacturing industry decreased, but increased in the financial, transport and construction industries. Also, the proportion of wage employees from urban areas rose, as it did in the retail and oil extraction industries. This was not the case for self-employed workers. In addition, the rate of trade union membership among wage employees decreased.

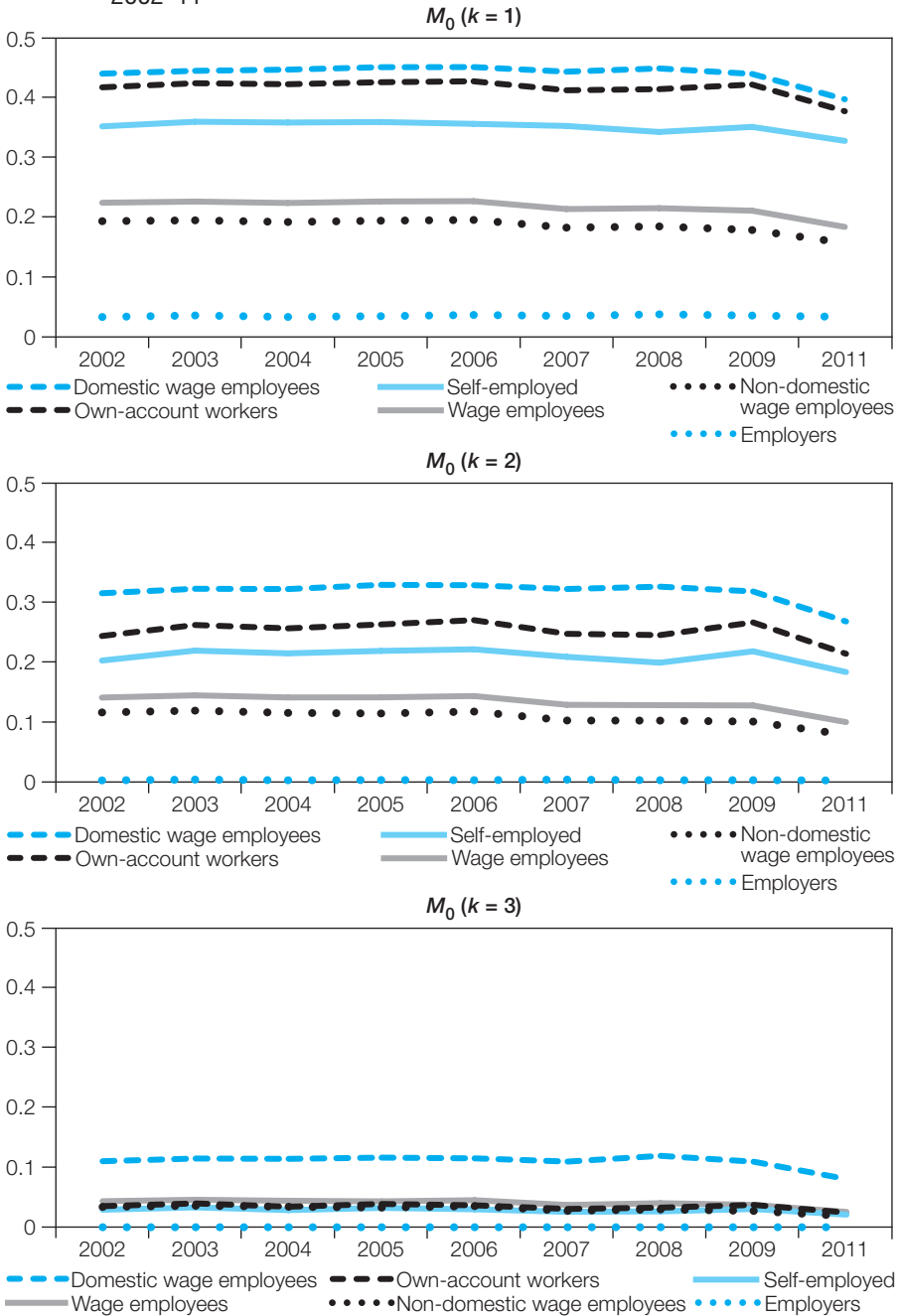
With regard to the dimensions of the employment quality index – earnings, formality (shown by “contracts” and “contributions”) and job tenure – an improvement was observed for both types of workers; in particular, the number of self-employed making social security contributions increased, as did earnings, especially for wage employees.

Multidimensional employment quality index results

The changes in employment conditions described above are captured by the multidimensional employment quality index. Figure 1 shows the results, for the three k thresholds defined ($k = 1, k = 2, k = 3$). According to our calculations, employment quality increased overall in Brazil over the period 2002–11, although the actual level of the index varied by occupational category. Data are first disaggregated into wage employees and self-employed workers. Wage employee data are further disaggregated into domestic and non-domestic wage employees, and data on self-employed workers are further disaggregated into employers and own-account workers. Over the period in question, the index decreased – in other words, employment improved – more noticeably for wage employees, particularly in the years 2006–07 and 2009–11. The index remained high – indicating low employment quality – for self-employed workers, staying relatively constant until 2007, at which point employment quality started to improve.¹⁸

¹⁸ Clearly, the more stringent the definition of low-quality employment – i.e. the higher the threshold k – the lower the number of workers whose employment is considered to be low quality; therefore, the index value will decrease, even though the total possible number of deprivations (nd) will remain the same.

Figure 1. Values of the multidimensional employment quality index for Brazil, 2002–11



Employers have a low index, and thus enjoy a relatively high level of employment quality. While the situation of own-account workers and domestic workers is more precarious, it is these two groups that saw the biggest improvements. Also, there was more variation in employment quality for own-account workers than for wage employees, reflecting the uncertainty of this type of employment, even in a period where more steady improvements were observed for other workers.

Employment quality and the impact of the policies implemented in the period in question can vary by region, age, sex, ethnicity, industry and other employment characteristics. For this reason, the index is decomposed by worker/employment characteristics. The results distinguish between k thresholds when differences are observed.

Figures A1 to A4 in the Appendix, which present the decomposed results separately for wage employees (A1 and A2) and self-employed workers (A3 and A4), show that, for both wage employees and the self-employed, employment quality varies by geographical region: the big cities have better employment quality, and urban workers have better employment quality than rural workers.¹⁹ Over the entire period, men had better employment quality than women, and whites better employment quality than non-whites. However, between 2009 and 2011 there was a particular improvement in employment quality for the initially most vulnerable groups (women and non-whites), which helped to close the gender gap and race gap. In addition, younger workers (aged 23–40) have lower employment quality, while workers aged 55–65, especially wage employees, experienced a significant increase in employment quality towards the end of the period. Lastly, employment quality improved overall in the manufacturing, transport, construction and financial industries.

Some improvements in employment quality differed between wage employees and the self-employed. On the one hand, figures A1 and A2 in the Appendix show that male, rural wage employees experienced relatively large improvements in employment quality and that, while wage employees in utilities and public administration have better employment quality, agriculture, domestic work and construction are more precarious industries. It is interesting, then, that it was precisely these last three industries, plus the oil extraction industries, that experienced the largest increases in employment quality over the period in question.

Some characteristics – such as firm size and public- and private-sector employment – were analysed exclusively for wage employees. The data show that wage employees working in microenterprises experienced a clear improvement in employment quality from 2007 onwards, precisely the time when the *Super Simples* Act and the subsequent Individual Microentrepreneurs Act were

¹⁹ Figures A1, A2, A3 and A4 in the Appendix show the results of index $M_0(k)$ calculated for wage employees and self-employed workers, with $k = 1$ and $k = 3$. Figures showing $k = 2$ can be obtained from the authors upon request.

implemented. In addition, public-sector workers with trade union membership had much higher employment quality than other wage employees. However, from 2006, improvements in employment quality were more pronounced for private-sector workers who did not belong to a trade union.

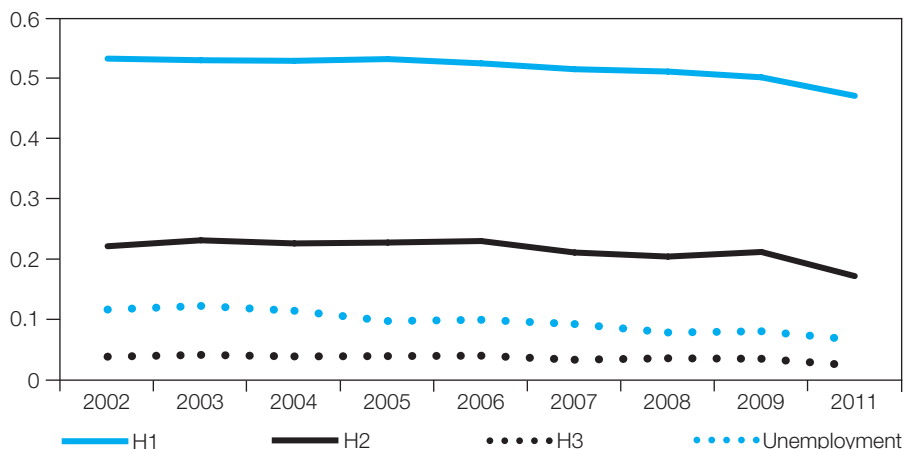
Figures A3 and A4 show that changes in employment quality for self-employed workers were not the same as those for wage employees. For the self-employed, it was women and urban workers who, from 2007, saw the most improvement in employment quality, while in 2009 employment quality worsened for rural workers and those in the north of the country. In addition, employment quality for self-employed workers is better in the financial, transport and social services industries, and worse in agriculture and manufacturing. The greatest improvement in employment quality was seen in the social services, retail and construction industries, which together account for nearly 60 per cent of self-employed workers in 2011 (see table A1).

In Brazil, there are trade unions for self-employed workers, including in the professional category. The index shows that employment quality is better for self-employed workers who belong to a trade union, although their employment quality is still not as good as that of wage employees. By 2011, the gap between unionized and non-unionized self-employed workers had closed, since employment quality had increased for non-union members, and worsened for union members.

These results show the impact of the public policies implemented in Brazil during the second half of the period in question, especially the improvements in employment quality in the transport and construction industries. These improvements could be related to the investment in infrastructure under the two Growth Acceleration Programmes, and to the *Minha Casa, Minha Vida* programme, which had planned to build one million homes between 2009 and 2010 (ILO, 2010), and in late 2010 had already surpassed that goal (UN-Habitat, 2013). The improvements could also be related to the preparations for the 2014 football World Cup and the Olympic Games in Rio de Janeiro in 2016.²⁰ In addition, improvements in the employment quality of domestic workers and own-account workers are consistent with the new legislation to encourage microentrepreneurs to pay social security contributions, and with the tax incentives introduced for employers of domestic workers. The improvements in employment quality experienced by wage employees in the oil extraction industry may be related to the implementation of the Petrobras Plan, which between 2008 and 2012 saw annual investment of US\$22,500 million. Other events that might also have had an effect on employment quality are the growth of the real minimum wage over the period in question, and the high growth rate, which reached 7.5 per cent in 2010.

²⁰ In line with data published by the Brazilian Government, based on the Ministry of Labour's General Register of Employed and Unemployed (*Cadastro Geral de Empregados e Desempregados, CAGED*), these preparations have an effect on the labour market, mainly through the creation of jobs with employment contracts.

Figure 2. Multidimensional and one-dimensional measures of employment quality in Brazil, 2002–11



Note: H1, H2 and H3 are frequency indicators (headcounts) for workers with 1, 2 and 3 employment quality deprivations, respectively.

Source: Authors' calculations based on data from the Brazilian National Household Survey Sample.

Another significant decomposition obtained with our methodology is that of the contribution made by each dimension to the total value of the index (the contributions of the three dimensions must add up to a total of 100). Figure A5 in the Appendix shows this analysis for wage employees and the self-employed. The data indicate that formality in Brazil (shown by “contracts” and “contributions”) accounts for 40 per cent of the value of the employment quality index for wage employees, and 70 per cent of the index for self-employed workers.²¹ For wage employees, as the number of workers who have a contract and make social security contributions has increased, so the contribution of the “formality” dimension to the value of the index has decreased. At the same time, the contribution of the “earnings” dimension increased over the period, so that in the end, the contributions of the three dimensions converged to similar levels. The “job tenure” dimension was more important for wage employees than for the self-employed, for whom the dimensions of formality and earnings account for 90 per cent of the index value.

This demonstrates the usefulness of multidimensional methodology in measuring employment quality, since any of the three dimensions analysed separately would show an incomplete picture. Figure 2 shows the frequency indicator (headcount) of the proportion of workers with one, two and three deprivations in the dimensions considered, compared with the unemployment rate, which is the one-dimensional measure commonly used to evaluate labour mar-

²¹ The relatively lower contribution of the “earnings” dimension may be related to the strong rise in the minimum wage implemented in Brazil from 2000.

ket results. The analysis shows that, despite having improved over the period, the unemployment rate remains at a similar level to the employment quality index of workers with deprivations in three dimensions – in other words, those with the worst employment quality. Therefore, this one-dimensional indicator does not reflect the precariousness of the labour market, and suggests more favourable employment conditions than those actually experienced by workers in Brazil. In other words, quantitative indicators overestimate improvements in employment quality, which justifies the use of multidimensional employment quality measures. This was confirmed in a study on Chile, which showed that in 2009, despite an increase in the unemployment rate, employment quality improved (Huneus, Landerretche and Puentes, 2012). This is probably due to a structural effect, where the workers who were laid off were those who had lower employment quality.

Multivariate analysis of the index

Estimation strategy

After analysing the heterogeneities and general trends observed with regard to employment quality in Brazil, we present a set of models that seek to identify systematic relationships between workers' characteristics and the quality of their jobs. We include three sets of variables. The first set captures workers' household characteristics (region, and urban/rural location). The second captures their personal characteristics (age, length of education, sex, ethnicity, whether they have a technical job), and the third set captures their job characteristics (union membership, months in current job, industry) plus, for wage employees, firm size and whether the firm is public or private.

To analyse the correlation between employment quality and other worker characteristics, we estimate the probability of observing low-quality employment using a standard probit model, as follows:

$$p_{ikt} = 1 \text{ if } y_{it}^* = X\beta + Z\gamma + W\delta + \varepsilon_{it} > 0$$

$$p_{ikt} = 0 \sim$$

where p_{ikt} equals 1 when worker i has low employment quality, according to threshold k at time t . The regressors used are those described above: workers' household characteristics (X), workers' personal characteristics (Z) and workers' job characteristics (W). In addition, year dummies are included.

To test robustness, we estimated models of the variables separately for each dimension – earnings, formality (“contracts” and “contributions”) and job tenure. In this way, we can verify the effects of aggregation and organization of the information summarized by the index.

For the earnings equation, a standard tobit model was estimated, neutralizing the effects of the labour market participation decision. For the job tenure equation, a model was used that neutralizes the effects of job tenure for workers unemployed at the time of the survey. Lastly, the formality

equation, which classifies workers according to three levels, was estimated using a standard ordered probit model.²² The same regressors were used in all three cases for the purposes of comparability.

Results of the multivariate analysis

Table A2 in the Appendix shows the probit model results, for wage employees and the self-employed, for the three definitions of employment quality (k thresholds).

Before discussing the results, we should clarify that many regressors are not exogenous. Because of the process of mutual selection by employer/worker, variables used in the regressions are simultaneous. First, firms choose workers with certain characteristics, and offer contracts based on these characteristics. Second, workers accept jobs that suit their preferences and economic conditions. If other variables correlated with this selection process exist, but are not observed, then the characteristic that we do observe and include in our model will not capture a causal effect on employment quality. Despite this, the empirical method chosen, and the characteristics of the data, should reduce the risks of this bias.

At the same time, the employment quality on offer at a firm is correlated with features such as the industry the firm belongs to, trade union membership, whether the job is technical, whether the firm is a microenterprise and whether it is in the public sector. Thus, trade union representation in a firm can affect employment quality, while employment quality may lead to trade union representation. Since we have no way of measuring exogenous variations in these dimensions, we cannot eliminate the possibility that simultaneity creates bias in the empirical results. Therefore, we cannot speak of causality, but rather of robust correlations, since we are controlling the effects of a large number of observable characteristics.

Our estimations confirm that employment quality improved over the period under consideration. This is shown by the significantly low probability of having poor employment quality in 2011, compared to any year in the period 2002–09. In addition, for wage employees this probability decreases more rapidly from 2006, and for the self-employed a significant drop was observed in 2007. Again, the results point to the relevance of the policies implemented in Brazil in the second half of the period under consideration.

The models confirm that there are significant differences in employment quality according to industry; wage employees have lower employment quality in domestic work, construction and agriculture, while the self-employed have lower employment quality in agriculture, construction and transport. The fact

²² The dependent variable in this model takes three values: 0 for wage employees who have no contract and make no social security contributions, or for self-employed workers who make no social security contributions; 1 for wage employees who have no contract but make social security contributions, or for employers who make no social security contributions; and 2 for wage employees who have a contract and make social security contributions, or for self-employed workers who make social security contributions.

that these differences remain once the effects of worker characteristics have been neutralized means that there is idiosyncratic heterogeneity in the distribution of workers in the different industries. In other words, industry-specific characteristics exist that are not captured by the observable worker characteristics.²³ This means that there are differences in employment quality between workers in different industries, even if one is comparing “equivalent” workers. This type of analysis was carried out in Chile, using panel data, and the results show that differences in employment quality disappear between equivalent workers in different industries (Huneus, Landerretche and Puentes, 2012).

The observed differences in employment quality between workers from urban and rural areas, in public and private sectors, and with and without trade union membership, are confirmed. We also see that, for the self-employed, being white, male and living in an urban area are more strongly correlated with improved employment quality than for wage employees. Similarly, union membership is more strongly correlated with employment quality for wage employees than for the self-employed. By contrast, longer education is more strongly correlated with employment quality for self-employed workers; however, this last correlation is biased by individuals’ skills.

In absolute terms, we can say that wage employment, trade union membership and public-sector employment are the features most strongly correlated with employment quality, thus resulting in a lower probability of being in poor-quality employment. For the self-employed, however, the characteristic that most reduces this probability is that of being male.

Interestingly, there is no linearity in the correlation between these characteristics and employment quality. For example, working in a microenterprise increases the probability of having low-quality employment when this is defined in terms of just one deprivation ($k = 1$), but the effect is smaller for three deprivations ($k = 3$). This means that the correlation between being in a microenterprise and having low employment quality is weaker when a stricter definition of low quality is used. A similar phenomenon occurs with the characteristics of trade union membership, public-sector employment, being male, having longer education and being in a particular industry.

Analysing the index’s three dimensions separately (earnings, formality and job tenure) enables us to identify complementary and substitute characteristics. Complementary characteristics will be those that correlate in the same way, i.e. with the same sign, with all three dimensions. Substitute characteristics will be those that affect the three dimensions in different ways, i.e. with different signs. The aim is to see what characteristics improve employment quality in all three dimensions (i.e. they complement the index) and what characteristics improve quality in one dimension, at the expense of others (i.e. they generate a relationship of substitution).

²³ However, one cannot rule out the hypothesis that some determinants of employment quality differentials between industries are due to unobservable worker characteristics, specific to each industry. In this case, we consider the characteristics to be specific to the industry, even though they are worker characteristics.

Table A3 in the Appendix shows, for wage employees and the self-employed, the sign of the correlation between the different worker characteristics and each dimension of the employment quality index. The results show that, for wage employees, working in a microenterprise has a negative effect in the dimensions of earnings, job tenure and formality – i.e. it is detrimental overall for employment quality. Working in the public sector, however, is positively correlated with higher earnings and formality, but not with greater job stability (i.e. the job tenure dimension). On the other hand, trade union membership is positively correlated with improved employment quality in terms of earnings, job tenure and formality (the latter result is observed for both wage employees and the self-employed). It can be said, then, that the dimensions are of a complementary nature for unionized workers in a microenterprise, and of a substitute nature for public sector workers.

Similarly, for wage employees, being male has a positive, complementary correlation with all employment quality dimensions, while for both wage employees and the self-employed, living in a rural area generates a relationship of substitution with these dimensions. Finally, for the different industries, the relationship is also one of substitution, except for wage employees in the financial industry, where a systematic positive correlation with all three dimensions is observed.

Conclusions

In this article we developed an index for measuring employment quality in an emerging country such as Brazil for the period 2002–11, using data from the Brazilian National Household Survey Sample carried out by the Brazilian Institute of Geography and Statistics. In the last decade, Brazil has undergone significant economic and social transformations. Progress has been made in terms of economic growth, fighting poverty and inequality, and the development of certain industries such as oil extraction. In addition, a number of reforms were implemented to encourage the formalization of employment, particularly that of vulnerable workers. Our study shows that there was considerable improvement in employment quality over the period in question. This is consistent with the findings of Saboia and Kubrusly (2012), who applied the Human Development Index methodology to develop a labour market index for Brazil, and concluded that conditions in the six major metropolitan regions improved over the period 2003–11.²⁴

From the descriptive and multivariate analysis carried out using our multidimensional employment quality index, we found that the changes were more pronounced in 2006–08 and 2009–11. While we are unable to identify or isolate the effects of the various developments, we can say that the regulatory and economic changes that might have generated the observed improvements

²⁴ Although this index considered several dimensions, the methodology used aggregate variables and it was not possible to classify workers according to employment quality.

in employment quality are: the labour reforms (tax incentives for the formalization of employment for own-account, rural and domestic workers), regulatory reforms (simplification of tax arrangements for microenterprises and small businesses) and Growth Acceleration Programmes, in the case of the 2006–08 improvements, and the package of measures to address the global economic crisis, in the case of the 2009–11 improvements. In addition, throughout the period there were significant increases in the real minimum wage, which could also have contributed to the rise in employment quality.

Our results show up differences between improvements in employment quality for wage employees and for self-employed workers, with the former experiencing the greatest improvement in quality. For wage employees, greater improvement in employment quality was found for men and for workers in rural areas, while for the self-employed, greater employment quality was observed for women and workers from urban areas. Significant progress was also seen for wage employees of microenterprises from 2007²⁵ (just after the implementation of the *Super Simples* Act, the Simplified Social Protection Plan and the subsequent Individual Microentrepreneurs Act), and while being unionized and working in the public sector are correlated with better employment quality (which was also found in the analysis of the Chilean labour market by Huneus, Landerretche and Puentes, 2012), the employment quality of non-unionized and private-sector workers also improved from 2007 onwards.

If we compare our results with the findings of the study on the Chilean labour market (*ibid.*), the main difference is that in Brazil there were many more significant, specific differences in employment quality between the various industries; employment quality was positively and systematically correlated with the manufacturing, oil extraction, utilities and financial industries.

Importantly, there has been considerable progress in labour market formalization in Brazil since 2007. When the index is decomposed by dimension, we note that since 2007, the contribution of the formality dimension has decreased, which means that low employment quality is increasingly less correlated with workers' informal employment.

While the initiative to measure employment quality is not new, there is still insufficient debate as to how to go about it. More studies in this area could foster a better understanding of the dynamics of the labour market and improve the evaluation of economic policies.

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²⁵ This result was verified by incorporating year dummies and "microenterprise" variable in the model on the probability of having low-quality employment. In 2007 there was a 6 per cent drop in the probability of having low-quality employment. These results are not reported in the article.

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Table A1. Statistical description of sample used to calculate the multidimensional employment quality index for Brazil, 2002–11 (concl.)

	Wage employees				Self-employed				
	2002		2011		2002		2011		Difference
	Average	Standard dev.	Average	Standard dev.	Average	Standard dev.	Average	Standard dev.	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	$[(3)-(1)]/(1)$
Construction	0.058	0.233	0.067	0.249	0.132	0.339	0.154	0.361	0.168***
Retail	0.159	0.366	0.191	0.393	0.340	0.474	0.326	0.469	-0.043***
Transport	0.052	0.223	0.060	0.237	0.060	0.238	0.064	0.245	0.064**
Financial industry	0.088	0.283	0.102	0.303	0.055	0.229	0.068	0.252	0.236***
Public administration and security	0.093	0.290	0.090	0.287	0		0		
Social services, education and health	0.313	0.464	0.283	0.450	0.096	0.294	0.101	0.301	0.051**
Domestic work	0.127	0.332	0.113	0.316	0		0		
Trade union membership	0.213	0.410	0.192	0.394	0.131	0.338	0.133	0.339	0.009
Microenterprise	0.340	0.474	0.341	0.474	0		0		
Public sector	0.214	0.410	0.203	0.402	0		0		
Employment contract	0.654	0.476	0.729	0.444	0		0		
Social security contributions	0.696	0.460	0.785	0.411	0.210	0.407	0.285	0.451	0.357***
Months in current job	75.559	85.626	77.820	90.593	120.035	116.213	135.358	121.451	0.128***
Real hourly salary (reais, 2005)	4.921	8.395	7.153	26.869	5.882	12.919	8.105	33.209	0.378***

Note: ***, ** and * denote 1, 5 and 10 per cent, respectively.

Source: Authors' calculations based on data from the Brazilian National Household Survey Sample.

Table A2. Probability of having low employment quality in Brazil, 2002–11 (probit model)

	Multidimensional employment quality index					
	Wage employees			Self-employed		
	k = 1	k = 2	k = 3	k = 1	k = 2	k = 3
Age entered labour market	-0.007*** [0.000]	-0.006*** [0.000]	-0.002*** [0.000]	-0.001* [0.001]	-0.006*** [0.001]	-0.000** [0.000]
Age entered labour market ²	0.000*** [0.000]	0.000*** [0.000]	0.000*** [0.000]	0.000*** [0.000]	0.000*** [0.000]	0.000*** [0.000]
Technical job	-0.007*** [0.002]	-0.019*** [0.002]	-0.016*** [0.001]	0.098*** [0.003]	-0.027*** [0.004]	-0.016*** [0.002]
Male	-0.039*** [0.001]	-0.045*** [0.001]	-0.021*** [0.001]	-0.129*** [0.002]	-0.130*** [0.002]	-0.023*** [0.001]
Rural area	0.029*** [0.002]	0.026*** [0.001]	0.001 [0.001]	0.091*** [0.003]	0.059*** [0.002]	-0.000 [0.001]
White	-0.027*** [0.001]	-0.020*** [0.001]	-0.009*** [0.001]	-0.078*** [0.002]	-0.066*** [0.002]	-0.011*** [0.001]
Length of education	-0.012*** [0.000]	-0.009*** [0.000]	-0.003*** [0.000]	-0.025*** [0.000]	-0.022*** [0.000]	-0.002*** [0.000]
Trade union membership	-0.176*** [0.001]	-0.121*** [0.001]	-0.036*** [0.001]	-0.119*** [0.002]	-0.058*** [0.002]	-0.014*** [0.001]
Microenterprise	0.160*** [0.001]	0.130*** [0.001]	0.042*** [0.001]			
Public sector	-0.380*** [0.010]	-0.280*** [0.007]	-0.089*** [0.004]			
Agriculture	0.069*** [0.009]	0.033*** [0.007]	-0.002 [0.004]	0.093*** [0.003]	0.095*** [0.003]	-0.027*** [0.001]
Oil extraction	-0.059*** [0.006]	-0.016*** [0.006]	0.000 [0.003]	0.045*** [0.015]	0.136*** [0.014]	0.015*** [0.005]
Manufacturing	-0.020*** [0.002]	-0.008*** [0.001]	-0.004*** [0.001]	0.021*** [0.002]	0.020*** [0.002]	-0.007*** [0.001]
Construction	0.115*** [0.002]	0.061*** [0.002]	0.014*** [0.001]	0.128*** [0.003]	0.009*** [0.003]	0.002** [0.001]
Transports	-0.020*** [0.002]	-0.010*** [0.002]	-0.008*** [0.001]	0.042*** [0.003]	-0.002 [0.003]	-0.002 [0.001]
Financial industry	-0.045*** [0.002]	-0.043*** [0.002]	-0.024*** [0.001]	0.005* [0.003]	-0.054*** [0.005]	-0.013*** [0.002]
Utilities	-0.083*** [0.007]	-0.040*** [0.008]	-0.021*** [0.007]	-0.273*** [0.074]	-0.078 [0.099]	-0.018 [0.023]
Public administration and security	-0.028*** [0.003]	-0.015*** [0.003]	-0.006** [0.003]			
Social services, education and health	-0.021*** [0.002]	-0.009*** [0.002]	-0.004*** [0.001]	0.038*** [0.003]	-0.023*** [0.003]	-0.007*** [0.001]
Domestic work	0.080*** [0.010]	-0.003 [0.007]	-0.001 [0.004]			
Region and year dummies	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	837 101	837 101	837 101	360 582	360 582	360 582
Pseudo R ²	0.27	0.2	0.24	0.24	0.18	0.2

Note: Marginal effects are shown. Robust standard errors are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations based on data from the Brazilian National Household Survey Sample.

Table A3. Correlations between worker characteristics and the dimensions of the multidimensional employment quality index for Brazil, 2002–11 (sign)

	Wage employees			Self-employed		
	Earnings	Job tenure	Formality	Earnings	Job tenure	Formality
Age entered labour market	0	–	+	0	–	0
Technical job	0	+	–	0	+	–
Male	+	+	+	0	+	+
Rural area	0	–	–	0	–	–
White	+	+	+	0	+	+
Length of education	+	–	+	+	–	+
Trade union membership	+	+	+	+	+	+
Microenterprise	–	–	–			
Public sector	+	–	+			
Agriculture	+	–	–	0	+	–
Oil extraction	+	+	0	0	+	–
Manufacturing	0	+	0	0	+	–
Construction	0	–	–	–	+	–
Transport	0	+	–	0	–	–
Financial industry	+	+	+	+	+	–
Utilities	0	+	+	0	+	+
Public administration and security	+	+	–			
Social services, education and health	0	+	–	+	+	–
Domestic work	+	–	–			

Note: “+” denotes a positive correlation, and “–” a negative correlation, with at least 10 per cent significance. “0” denotes a correlation statistically equal to zero.

Source: Authors' calculations based on data from the Brazilian National Household Survey Sample.

Figure A1. Decomposition of multidimensional employment quality index for wage employees, by personal and job characteristics ($k = 1$), 2002–11

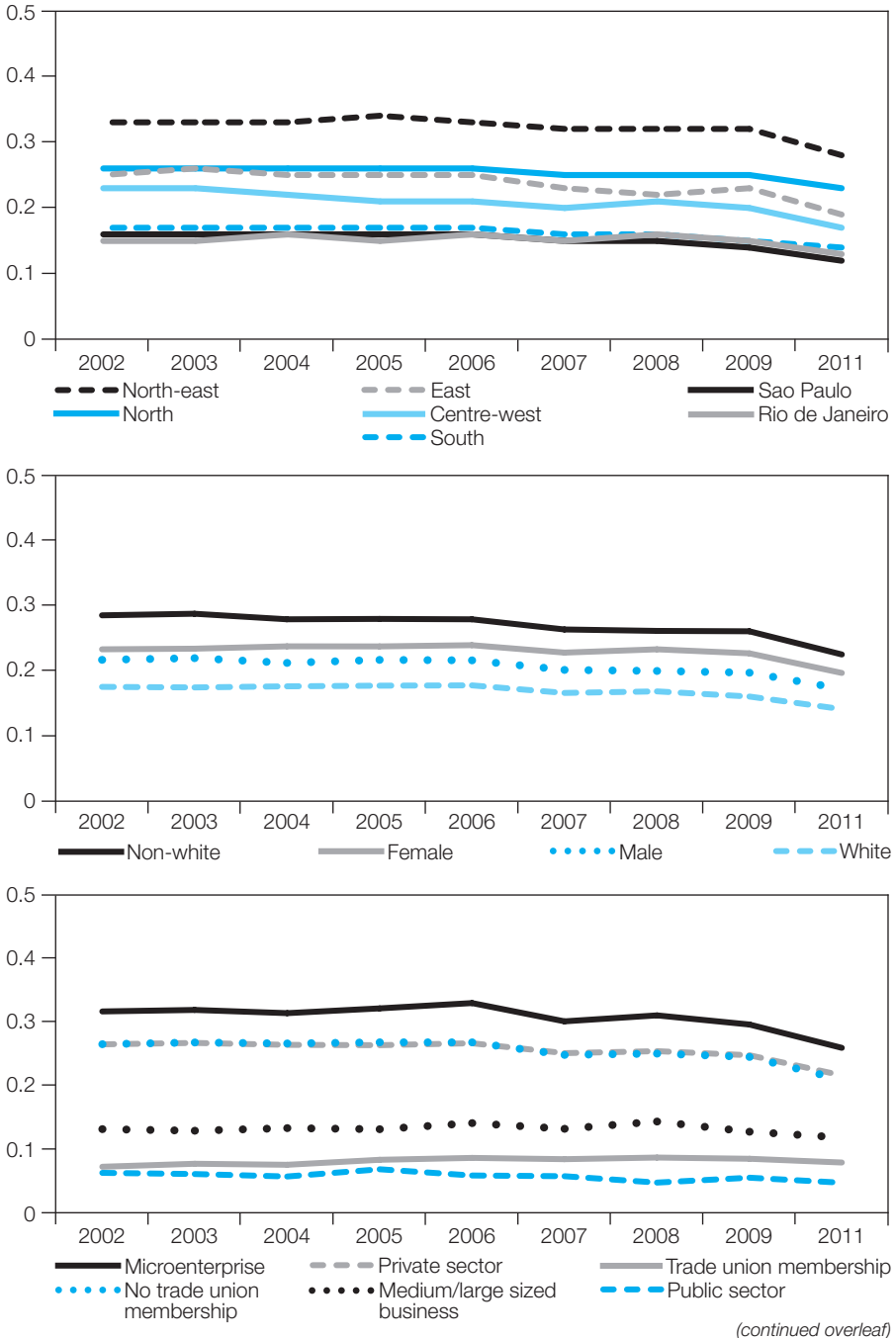
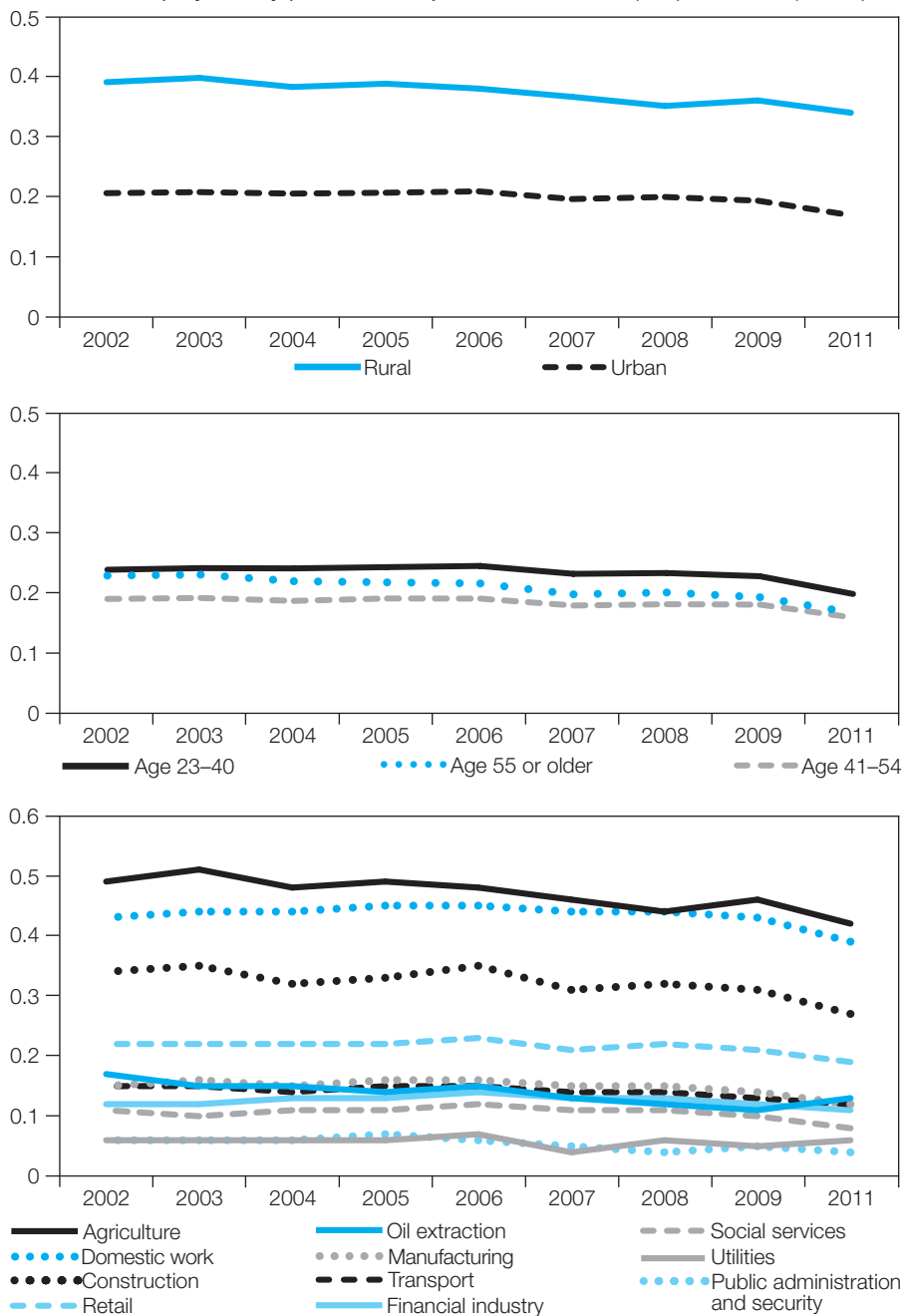
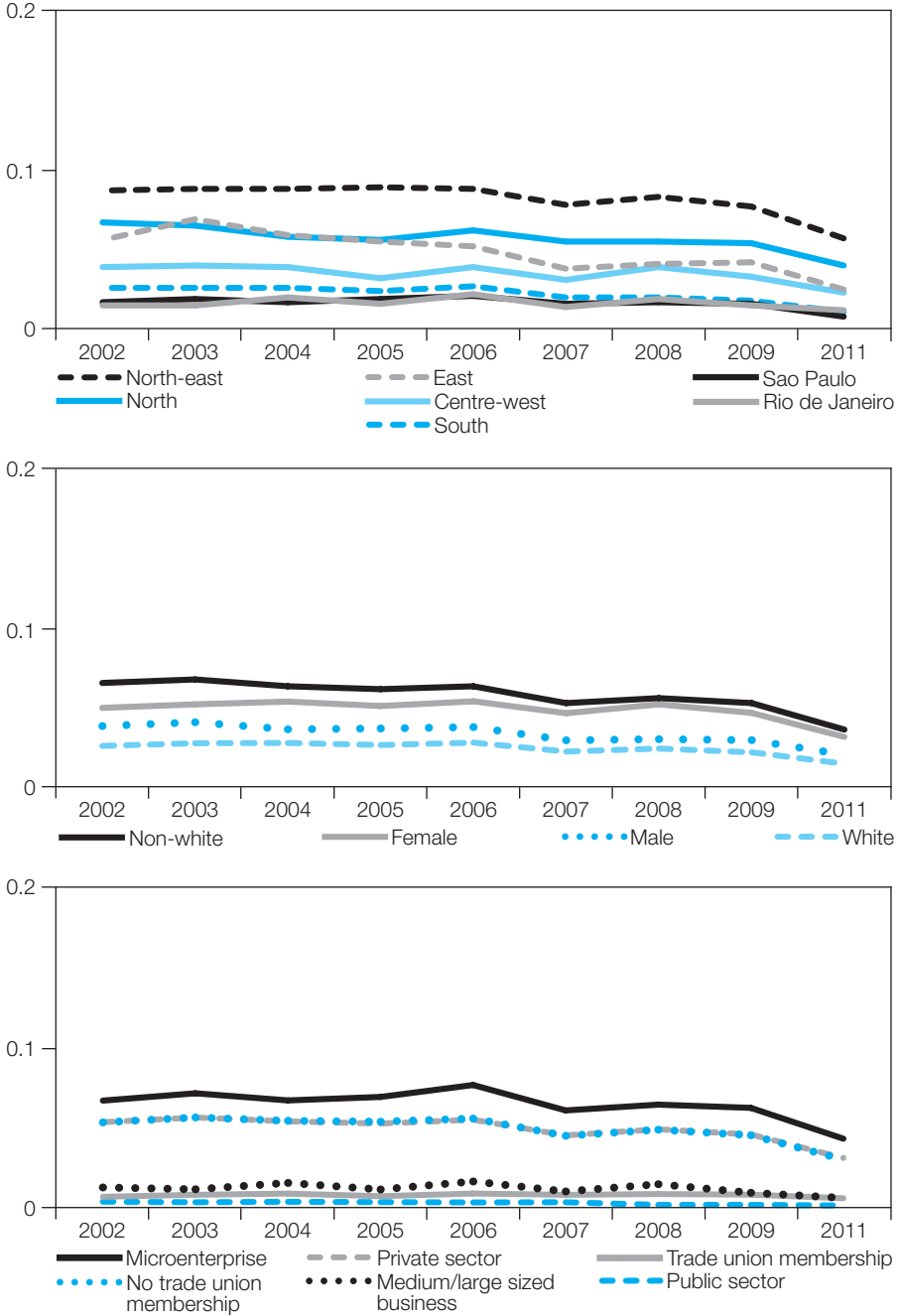


Figure A1. Decomposition of multidimensional employment quality index for wage employees, by personal and job characteristics ($k=1$), 2002–11 (concl.)



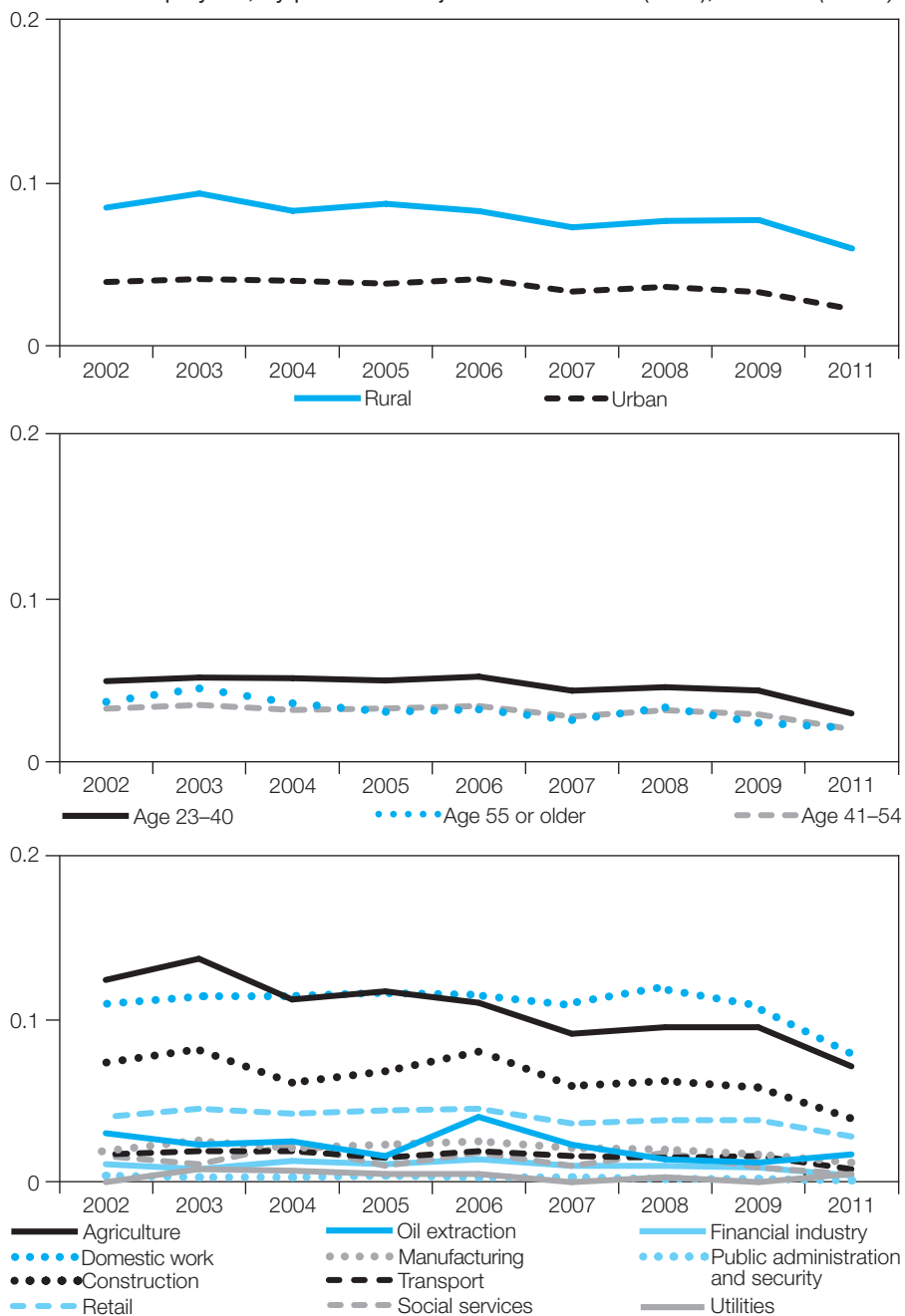
Source: Authors' calculations based on data from the Brazilian National Household Survey Sample.

Figure A2. Decomposition of multidimensional employment quality index for wage employees, by personal and job characteristics ($k = 3$), 2002–11



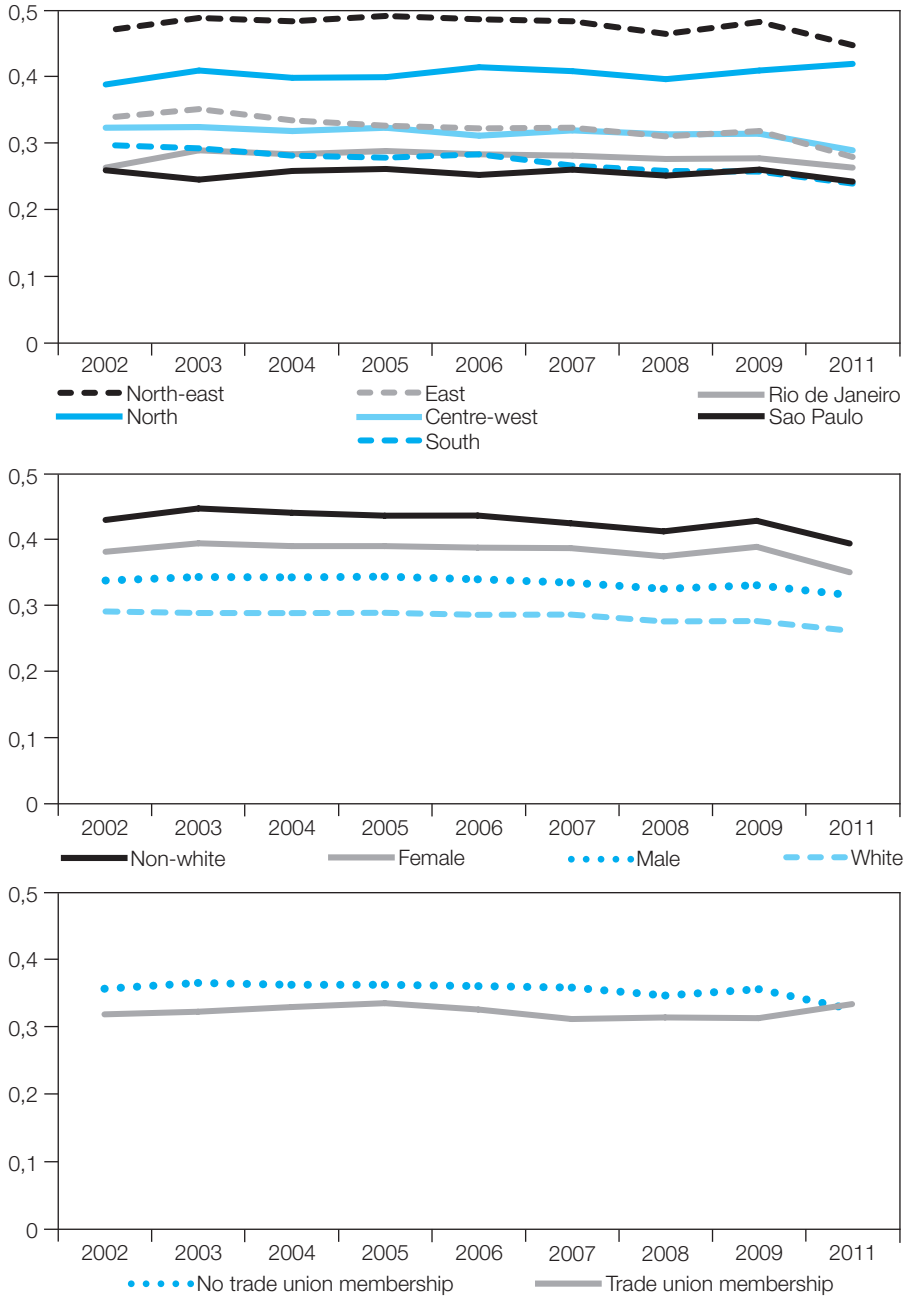
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Figure A2. Decomposition of multidimensional employment quality index for wage employees, by personal and job characteristics ($k = 3$), 2002–11 (concl.)



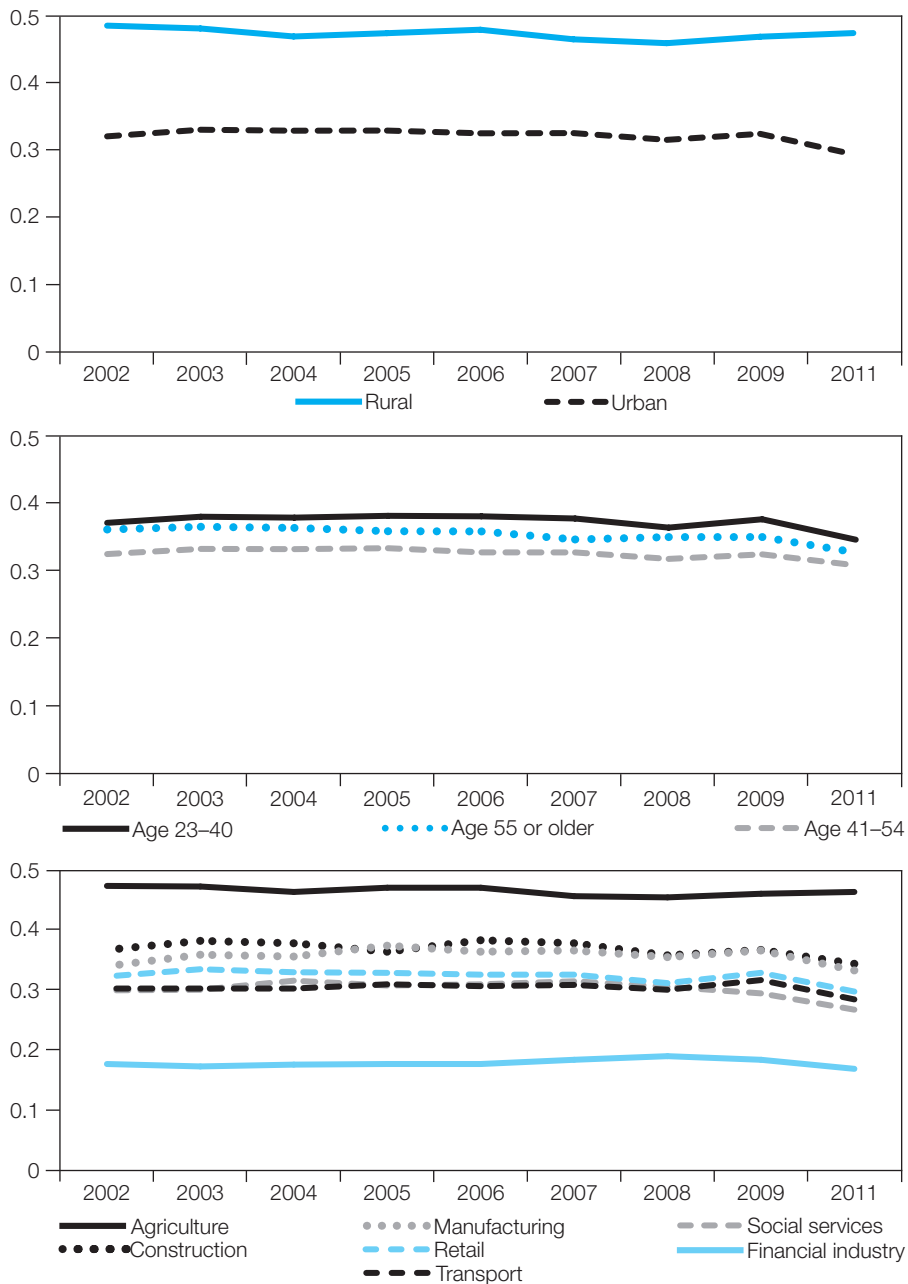
Source: Authors' calculations based on data from the Brazilian National Household Survey Sample.

Figure A3. Decomposition of multidimensional employment quality index for self-employed workers, by personal and job characteristics ($k = 1$), 2002–11



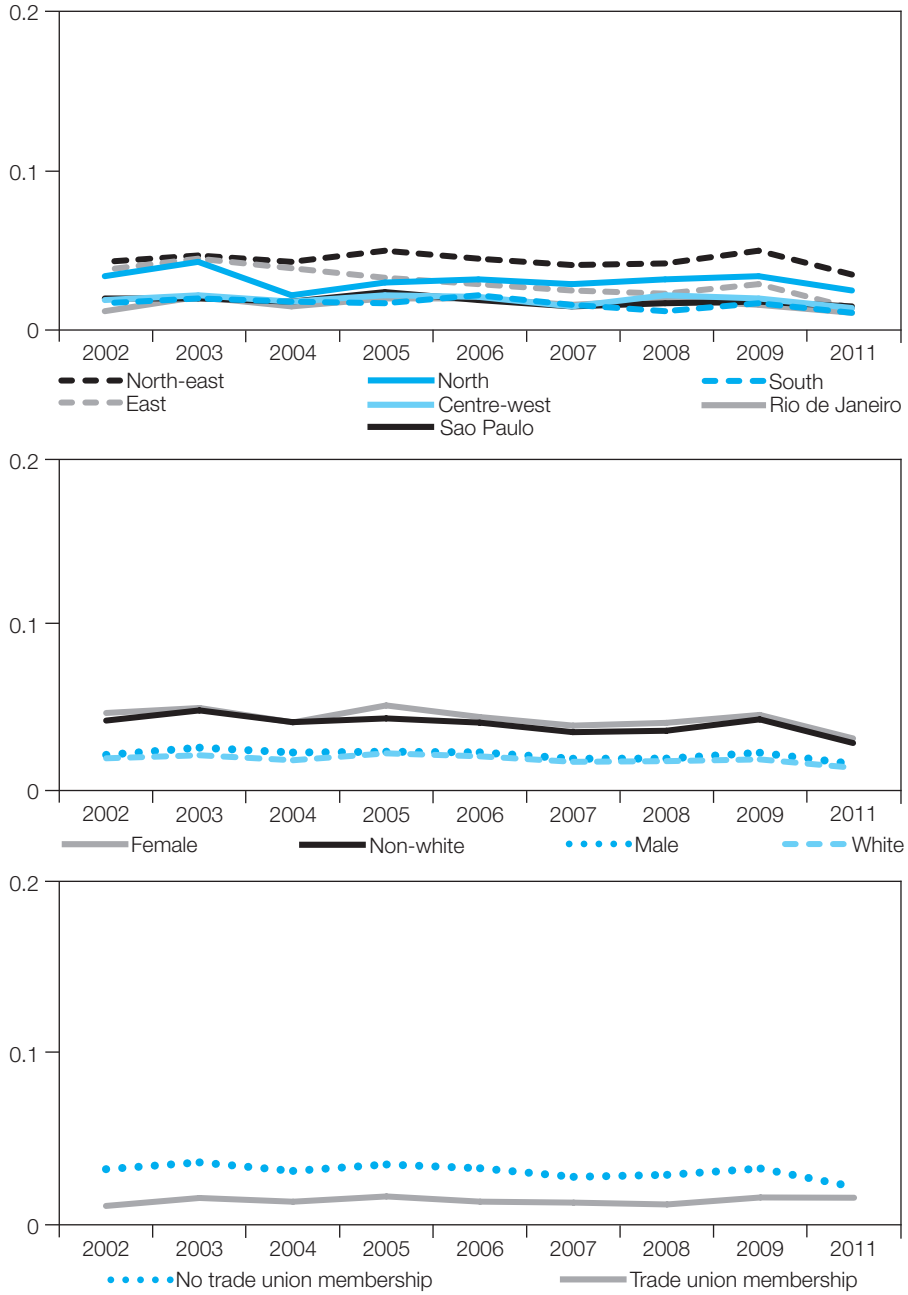
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Figure A3. Decomposition of multidimensional employment quality index for self-employed workers, by personal and job characteristics ($k=1$), 2002–11 (concl.)



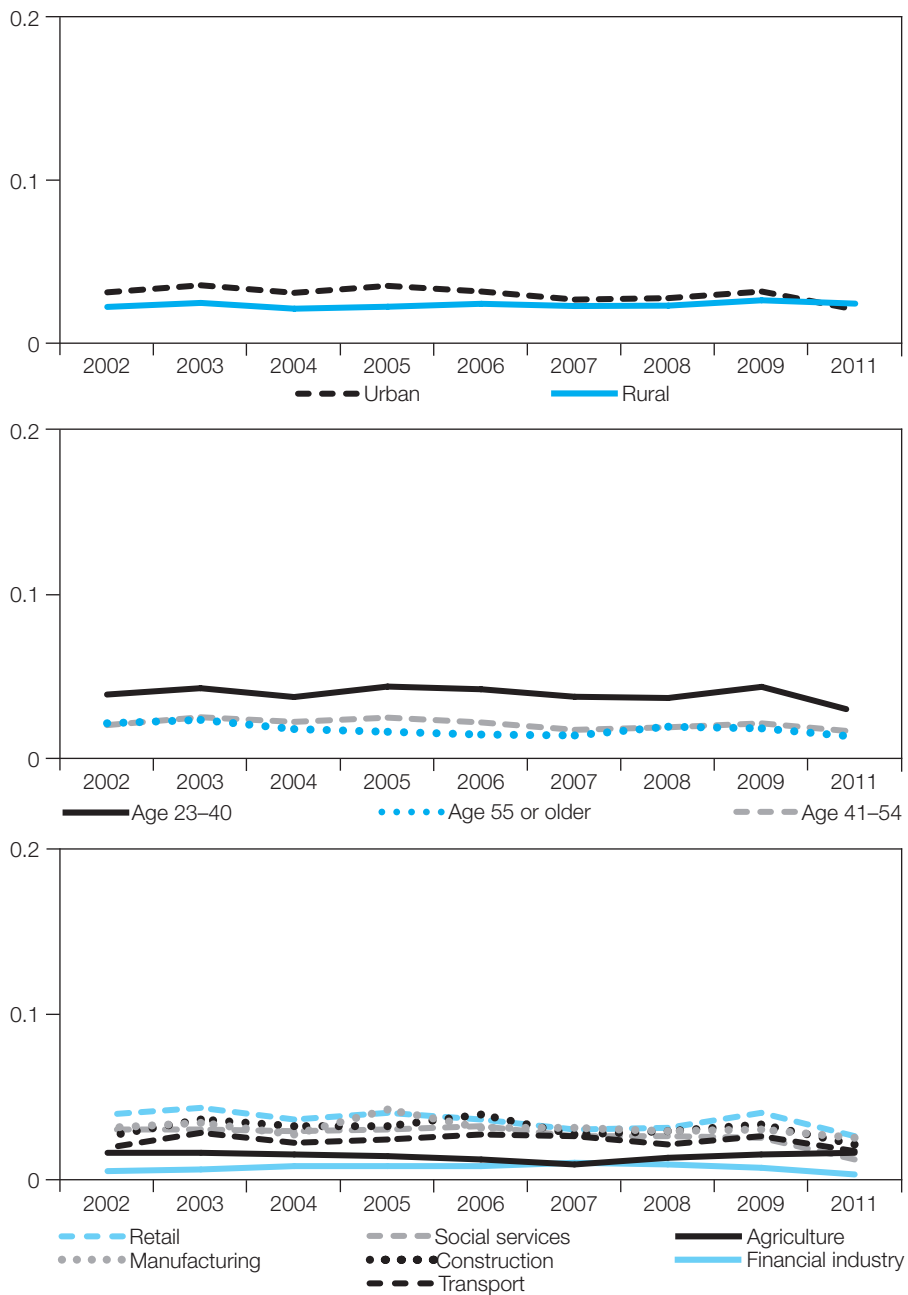
Source: Authors' calculations based on data from the Brazilian National Household Survey Sample.

Figure A4. Decomposition of multidimensional employment quality index for self-employed workers, by personal and job characteristics ($k = 3$), 2002–11



(continued overleaf)

Figure A4. Decomposition of multidimensional employment quality index for self-employed workers, by personal and job characteristics ($k = 3$), 2002–11 (concl.)



Source: Authors' calculations based on data from the Brazilian National Household Survey Sample.

Figure A5. Decomposition of multidimensional employment quality index by dimensions “earnings”, “formality” and “job tenure”, 2002–11

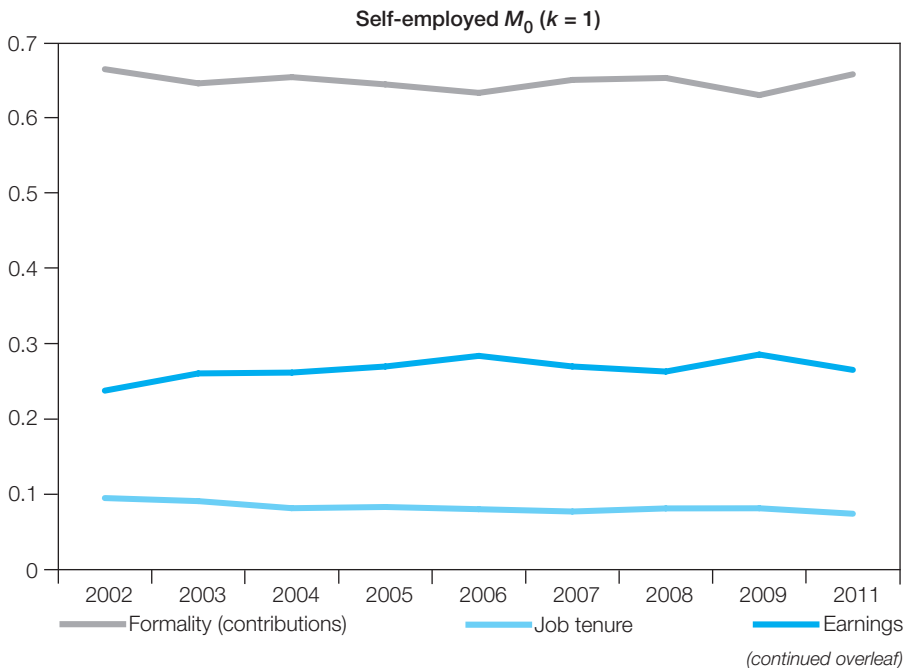
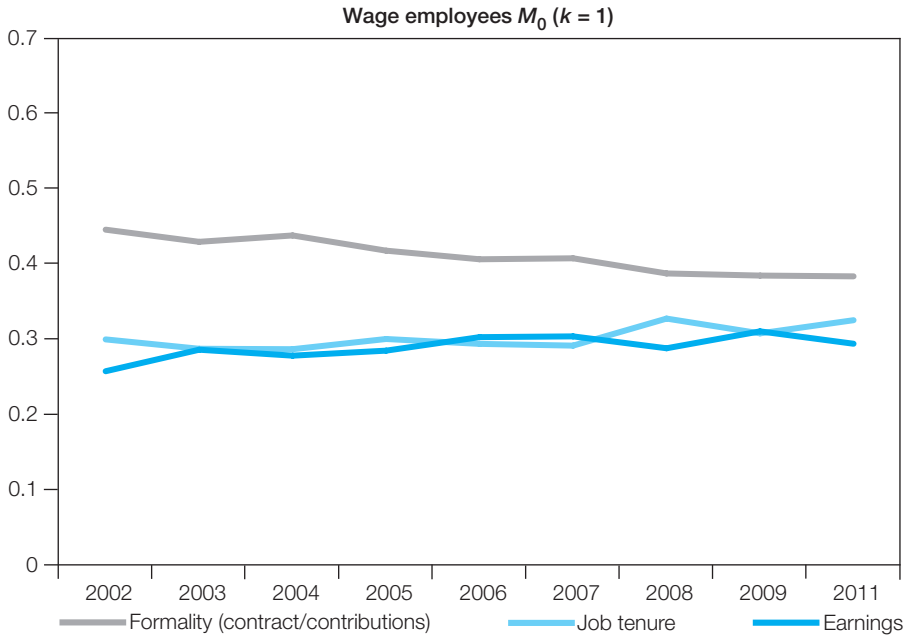
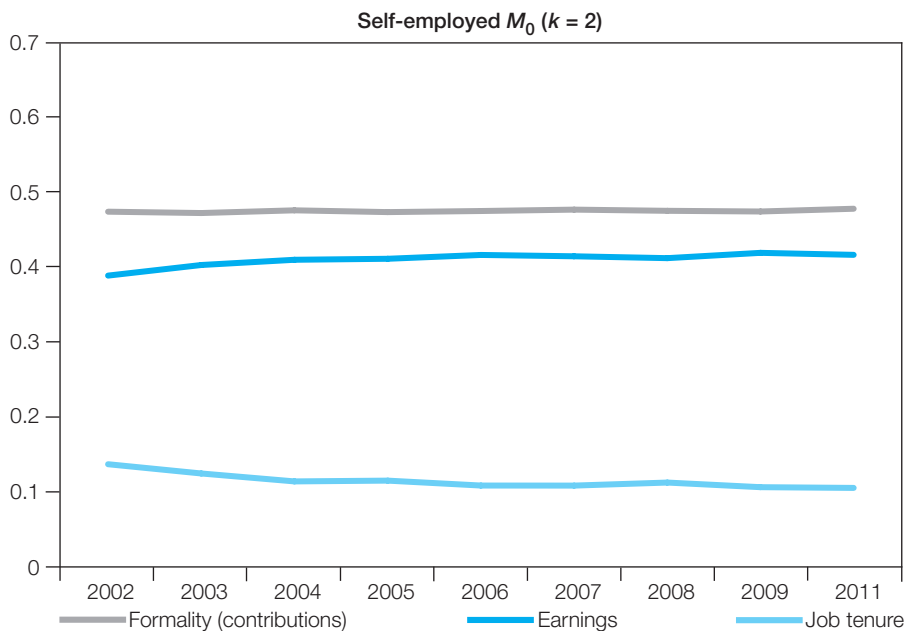


Figure A5. Decomposition of multidimensional employment quality index by dimensions “earnings”, “formality” and “job tenure”, 2002–11 (*concl.*)



Source: Authors' calculations based on data from the Brazilian National Household Survey Sample.