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ABSTRACT

Wage Discrimination Based on the Country of Birth: Do Tenure and Product Market Competition Matter?*

Using a merged employer-employee panel dataset of 13,000 firms for the 1999-2010 period, this paper aims to quantify wage discrimination against migrant workers based on their countries of birth, with workers' tenure and firm product market competition as moderator variables. To do so, we specify a wage-setting equation à la Bartolucci (2014) that includes a direct measure of worker productivity. We control for a wide range of worker and firm characteristics, as well as time-invariant unobserved heterogeneity in firms and potential endogeneity in the composition of the workforce. Our preferred results estimate that wage discrimination against non-EU15 workers in Belgium is in the order of 6.1%. This figure hides large disparities in wage discrimination against foreign-born migrants depending on their countries of birth, as well as the vanishing of wage discrimination against migrants with tenure. Our results also suggest that wage discrimination disappears in highly competitive product market situations.

JEL Classification: J24, J71, D41

Keywords: migrants, wage discrimination, workers' countries of birth, tenure, product market competition, direct productivity measure

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1 Introduction

Europe has been facing a large-scale influx of migrants, defined as individuals whose country of birth is different from their country of usual residence (OECD 2017). The latest data from Eurostat indeed show that Belgium, for instance, was host to more than 126,000 migrants in 2017, 80% of which were aged between 15 and 64, making them eligible for the labour market (Eurostat 2019a). However, it seems that the situation of migrants in the Belgian labour market is significantly worse than that of natives (Federal Public Service Employment, Labour and Social Dialogue and Unia 2017). For instance, whereas the unemployment rate of the 15-64 population was of 4.7% among natives in 2018, it amounted to 11.5% among migrants. In the same line, the mean net income was 27,915 euros for Belgian workers and only 21,652 euros for migrants (Eurostat 2019b, c). These differences lead to higher poverty among the migrant population. Indeed, we observe that no less than 33.9% of migrants aged between 18 and 64 are at risk of poverty, compared to just 10.6% of the native population (Eurostat 2019d).

Moreover, the occurrence of earnings disparities in a host country has been well-evidenced in the literature (Chiswick 1978; Borjas 1985; Nanos and Schluter 2014). The main sources of these wage inequalities can be attributed not only to productivity differentials coming from human capital discrepancies (Heath and Cheung, 2007), but also to occupational and sectoral segregation (e.g. Bayard et al. 1999; Peri and Sparber 2009). It is also plausible that wage differentials between native and migrant workers partly come from a discriminatory behaviour by employers, as highlighted by a growing empirical literature. At an empirical level, most existing studies analysing ethnic wage discrimination suffer from methodological and/or data limitations. Indeed, a first range of papers base their analyses on Mincerian equations and/or Oaxaca-Blinder decompositions (e.g. Daneshvary 1993; Velling 1995; Vertommen and Martens 2006; Borjas and Katz 2007; Chiswick et al. 2008; Barrett et al. 2012). In these papers, the authors compute wage-setting equations for different groups of workers by using individual-level information about human capital and job characteristics and then attribute the unexplained difference in wages between two types of 'equal' workers to wage discrimination. However, these authors use *in*direct measures of workers' productivity, which may introduce some bias in their studies. In addition, their analyses are generally based on cross-sectional data, which hinders the possibility to address important econometric issues.

Other methods have been built in order to analyse wage discrimination using a *direct* measure of workers' productivity, thanks to the availability of matched employer-employee data. To our knowledge, the most recent method, built by Bartolucci (2014), consists in estimating a wage equation at the firm level, including the percentage of hours worked by migrants, added value as a *direct* measure of productivity, and several control variables. Using this technique, Bartolucci (2014) and Kampelmann and Rycx (2016) find evidence of ethnic wage discrimination in Germany against workers born in another country and in Belgium against workers born outside EU15 countries, respectively. However, in both studies, a substantial heterogeneity within each group of migrant workers is likely to hide discrepancies in wage discrimination depending on the migrants' countries of birth. To tackle this issue, we decide to divide migrant workers (workers born outside EU15 countries) in 6 subgroups, to be compared to native workers (workers born in EU15 countries), based on detailed descriptive evidence provided for Belgium by the Federal Public Service Employment, Labour and Social Dialogue and Unia (2017). Next, we would like to test the sensitivity of wage discrimination against migrants in relation to a moderating variable: migrants' tenure within firms. According to statistical discrimination theory, wage differentials between native and migrant workers could decrease as the duration of the

employment relationship within a firm increases, given that this duration reduces information asymmetry about migrants' productivity and, accordingly, reduces their wage penalty.

Finally, wage discrimination against migrants may also vary with firm product market competition. Indeed, Becker (1957) introduces the idea that wage discrimination should disappear in a situation of perfect competition, since profits cannot cover additional discrimination costs. However, Becker's theory is more and more challenged by other theories, according to which wage discrimination remains or may even be worsened in a situation of perfect *product* market competition when imperfections exist in the *labour* market (Berson 2011).

This paper therefore has two main objectives. The first one is to put the analysis of wage discrimination against non-EU15 workers to an updated test, applying the most recent Bartolucci technique with a direct measure of mean firm-level workers' productivity. The second objective is to test the sensitiveness of ethnic wage discrimination to different worker and firm characteristics (i.e. migrants' different countries of birth, tenure, and firm product market competition) in Belgium. To our knowledge, we are the first to use a *direct* measure of productivity to tackle the heterogeneity among migrant workers in terms of country of birth and to test altogether the impacts of tenure and product market competition on wage discrimination.

To achieve these objectives, we take advantage of our access to a large matched employer-employee panel sample for the 1999-2010 timespan, coming from four merged data sets: the Structure of Earnings Survey (SES), the Structure of Business Survey (SBS), the National Register, and the Overview sector Indicators Data AGORA-MMS Project. This panel dataset offers several advantages. First, it covers a large part of the Belgian private sector. Second, it provides accurate information on workers (i.e. gender, education, tenure, working time, age, and country of birth) and on firms (i.e. wage, added value, firm size, firm bargaining level, sector, and sectorial product market competition). Finally, the richness of the data enables us to address important econometric issues related to the potential endogeneity in the composition of the workforce and unobserved time-invariant firm characteristics.

The remainder of this paper is structured as follows. Section 2 summarizes the literature on ethnic wage discrimination and whether it can be related to migrants' country of birth, tenure and product market competition. Section 3 introduces our methodological approach, and Section 4 provides an insight on our dataset and descriptive statistics. Section 5 presents our econometric results, and Section 6 concludes.

2 Literature review: wage differentials and wage discrimination against foreigners

2.1 A theoretical and empirical overlook

Wage differentials between native and migrant workers may occur for different reasons. First, they may partly be due to productivity differentials coming from human capital discrepancies attributed to migrants' language abilities (e.g. Chiswick 1991; Chiswick and Miller 1995; Borjas 1999; Carnevale et al. 2001; Dustmann and van Soest 2002), literacy skills (Ferrer et al. 2004; Himmler and Jäckle 2018), schooling quality (Sweetman 2004), job tenure attainment (McDonald and Worswick 1998), and different school-to-work transitions (Friedberg 2000; Neels 2000; Bratsberg and Ragan 2002; Aydemir and Skuterud 2005; Euwals et al. 2010; Baert and Cockx 2013). Another reason may be occupational and sectoral segregation: migrant workers may be unequally distributed across occupations and

industries, confining them to specific jobs that remunerate less (Aydemir and Skuterud 2008; Elliott and Lindley 2008; Peri and Sparber 2009).

Wage differentials may also result from discriminatory behaviours. According to the definition proposed by Heckman (1998), wage discrimination occurs when two equally productive workers are paid differently on the basis of different non-productive characteristics, such as race. A first theory explaining the mechanisms behind wage discrimination is the taste-based theory developed by Becker (1957). Following this theory, some employers, co-workers or customers are prejudiced against an intrinsic characteristic of a certain type of workers, such as the country of origin. This prejudice translates into a disutility for the prejudiced individual when he/she is in contact with the type of worker he/she dislikes. To avoid this disutility, employers tend to look further and pay higher wages to the kind of worker they prefer, thereby inducing additional costs. Consequently, equally productive workers can be paid differently because of an employer's dislike towards a worker's intrinsic characteristic. The second theory on wage discrimination is statistical discrimination (Phelps 1972; Arrow 1973). This theory assumes imperfect information: employers lack information about the job applicant's productivity but can observe their non-productive characteristics. To set the worker's wage, employers then use the productivity statistical mean of the group to which a job applicant belongs as a proxy for the applicant's individual productive characteristics. So, two equally productive individuals belonging to different groups of workers may be treated differently because of their groups' statistical characteristics.

From an empirical point of view, a first group of studies on wage discrimination against migrants (see Appendix Table A.1) apply the Mincer equation (1974) or the Oaxaca and Blinder (1973) specifications, using cross-sectional or longitudinal information at an individual level, where workers' productivity is measured *in*directly (e.g. Daneshvary 1993; Velling 1995; Vertommen and Martens 2006; Borjas and Katz 2007; Chiswick et al. 2008; Barrett et al. 2012). However, as these studies exploit indirect measures of workers' productivity (such as education and job characteristics), the remaining unobserved variables of workers' productivity may bias their estimates.

A way to address the absence of a satisfactory productivity estimator at the worker level would be to use output measures at the firm level as direct productivity measures. Hellerstein et al. (1999) adopted an original method: they used firm-level data deriving from matched employer-employee data in order to compare the relative marginal productivity and relative marginal wage of a type of workers' (e.g. migrants) to those of a reference type of workers (e.g. natives). The authors created a system of two equations in which they regress two dependent variables (i.e. wage and productivity) on the same independent variables. This technique allows them to estimate mean productivity and mean wage differentials between different groups of workers and to test whether these differentials are significantly different from each other. To our knowledge, although the use of firm-level data to grasp ethnic wage discrimination is now widespread (Aydemir and Skuterud 2008; Simón et al. 2008; Aeberhardt and Pouget 2010; Carneiro et al. 2011), no study applied the Hellerstein et al. technique for that purpose. The above-mentioned studies simply extended the Mincerian or the Oaxaca-Blinder equation with additional information about the firm as independent variables but did not use direct measures of workers' productivity in their equation specification.

An improvement on the Hellerstein et al. (1999) technique was achieved by Bartolucci (2014). In this most recent technique, the latter only uses one equation and introduces direct firm-level productivity information (i.e. added value) as an independent variable in the wage-setting regression. The author uses this technique to study wage discrimination against migrants in Germany and estimates that migrants could suffer wage discrimination in the order of 12.8%. The only other study, to our knowledge,

that uses this approach is that of Kampelmann and Rycx (2016) for Belgium. Their first difference estimates indicate that non-EU15 workers are paid 2% less than equally productive EU15 workers.

2.2 The potential role of the worker's country of birth

Considering that heterogeneity among non-EU15 workers might hide discrepancies in wage discrimination, some authors studying ethnic wage discrimination go a step further by dividing migrants by their countries of origin. In the empirical literature, there is no clear consensus on the number of subgroups to consider when studying wage discrimination against migrants. For example, different studies (see Appendix Table A.1) using different types of data (worker-level or firm-level) divided their population by origin into either 2 (Chiswick et al. 2008; Simón et al. 2008; Aeberhardt and Pouget 2010; Bartolucci 2014), 4 (Barrett et al. 2012) or even 14 subgroups (Velling 1995). Worker-level data-based studies suggest either heterogeneity of wage discrimination among migrants (Velling 1995; Chiswick 2008; Simón et al. 2008; Barrett et al. 2012) or occupational segregation (Aeberhardt and Pouget 2010). However, Bartolucci (2014), who bases his regressions on firm-level data, finds that workers born in developing countries suffer slightly less from wage discrimination than workers born in developed countries. This wage discrimination difference is marginally significant and is not robust to changes in the productivity variable.

In the case of Belgium, the study by the Federal Public Service Employment, Labour and Social Dialogue and Unia (2017) supports (on the basis of detailed descriptive statistics) that, while there is little evidence of wage heterogeneity between Belgian and EU15 workers, a huge heterogeneity appears between non-EU15 groups of workers. Notably, workers from Northern and Latin American, Asian and South Pacific countries earn higher wages than Maghreban or other African workers. Vertommen and Martens (2006) conduct a study on wage discrimination between native Belgian workers, new Belgian workers and foreigners, these last two groups being subdivided into 9 subgroups according to workers' regions of birth. To do so, they estimate Mincerian wage equations (with a limited number of control variables) and Oaxaca-Blinder decompositions. Their results suggest that having Northern and Sub-Saharan African origins, despite possessing the Belgian nationality, decreases wages, while having Western and Eastern European origins has the opposite effect.

All in all, these studies confirm the need to consider potential heterogeneity among migrants. Moreover, considering a larger number of subgroups should reduce the heterogeneity within each subgroup and improve precision when estimating wage discrimination. Our data allow us to divide migrant workers into 6 subgroups by nationality at birth, ensuring, on the one hand, less heterogeneity in terms of birth/origins within each subgroup and, on the other hand, a sufficient number of available observations in each subgroup.

2.3 Does tenure play a role?

According to the statistical discrimination theory (Phelps 1972; Arrow 1973), firms do not possess full information about their workers' actual productivity and thus rely on group average productivity as a proxy to estimate it. However, considering tenure as firm-specific labour market experience, employers should continuously learn about their workers' *true* productivity with tenure, leading them to reduce or erase discrimination behaviours as tenure increases. A complementary argument comes from the monopsonistic discrimination theory (Hirsch and Jahn 2015), which translates into the idea that some workers have a less elastic labour supply curve due to poor information about the labour market they evolve in. Hence, they are more subject to employers' monopsonistic behaviours and to

wage discrimination. However, these workers' knowledge about the labour market should increase with tenure, and they should thus be less likely to endure wage discrimination as their mobility on the labour market increases.

To our knowledge, only two studies (see Appendix Table A.2) tested the effect of tenure on wage discrimination against migrants. Studying wage gaps against foreign-born workers in New Zealand, Gill (2013) found no evidence of statistical wage discrimination against foreign-born men and observed that wage discrimination against Asian or Pasifika women decreases by 1.15% with each additional year of tenure. Bartolucci (2014) found that the mean tenure of migrants in a firm is not statistically correlated with discrimination. Since there is no clear-cut result in empirical studies concerning this relationship, it would be interesting to test whether wage discrimination against migrants decreases with tenure.

2.4 What about product market competition?

One of the earliest wage discrimination theories (Becker 1957) posits that wage discrimination should disappear in a situation of perfect competition. However, Becker's theory is more and more challenged by other theories, according to which wage discrimination might remain or even be worsened in a situation of perfect *product* market competition, depending on imperfections in the *labour* market (Berson 2011).

In the taste-based discrimination theory, Becker (1957) introduced the idea that wage discrimination tends to disappear when linked with highly competitive product markets. Indeed, as a discriminatory employer pays higher wages to his/her privileged but equally productive workers, he/she is therefore less competitive than his/her non-discriminatory competitors. In this context, a discriminatory monopolistic firm can afford these extra costs as long as the extra profits associated to its monopoly power enable to cover them, but it becomes more difficult for it to remain in the market when competition increases and extra profits decrease. And, in the extreme case of perfect product market competition where no extra-profits are available, wage discrimination should no longer be sustainable.

However, this result prevails under the assumption of perfect competition in the *labour* market. If we relax this assumption, wage discrimination may not depend on product market competition anymore. Put differently, wage discrimination may persist in a situation of perfect *product* market competition as a result of imperfections in the *labour* market (Berik et al. 2004; Kogan 2007). Indeed, according to the search theory, some groups of workers, such as migrants, may be afflicted by additional search costs when looking for a (new) job (Black 1995). It would thus be costlier for migrant workers to look for a job, leading to a reduction of their bargaining power and enabling discriminatory employers to lower the workers' wages. Moreover, the statistical discrimination theory (Phelps 1972; Arrow 1973) suggests that information asymmetry may exist independently of the product market competition situation, enabling discriminatory employers to pay lower wages to migrant workers in any event.

Several empirical studies have tested the relationship between wage discrimination and product market competition. A substantial amount of these focus on gender wage discrimination and present mixed results concerning the potential vanishing of wage discrimination in the presence of high product market competition. Some of the authors support Becker's theory (Black and Strahan 2001; Hellerstein et al. 2002; Black and Brainerd 2004; Belfield and Heywood 2006; Weichselbaumer and Winter-Ebmer 2007; Hirsch et al. 2012; Heyman et al. 2013; Juhn et al. 2013; Hirsch et al. 2014; Cooke et al. 2018), and a fewer number do not (Winter-Ebmer 1995; Agesa et al. 2001; Berik et al. 2004).

Regarding the relationship between ethnic wage discrimination and product market competition, few studies have been conducted (see Appendix Table A.3), and their results tend to support Becker's theory only. Peoples and Saunders (1993) and Peoples and Talley (2001) have studied the impact of the deregulation of the trucking market and of the public-transit bus sector privatization, respectively, on wage discrimination against black truck/bus drivers in the US. They concluded that the increased competition resulting from market deregulation and privatization significantly lowered the wage gap between white and black truck/bus drivers. More recently, Ohlert et al. (2016) studied wage discrimination against migrants in Germany in relation to the level of competition in the product market by using the Herfindahl-Hirschmann index and the share of exports in firms' revenues as proxies for product market competition. Controlling for an indirect measure of workers' productivity, the authors found that increased competition in the product market is likely to decrease the unexplained wage differentials between native and migrant workers. In this paper, we rather consider a direct measure of mean workers' productivity using a framework *à la* Bartolucci in order to test whether and how potential ethnic wage discrimination against various subgroups of migrants varies according to the degree of product market competition.

3 Methodology

3.1 The model and the investigated environments

As wage discrimination refers to a difference in wages across equally productive workers, information about both wages and productivity is needed to economically grasp wage discrimination. However, direct productivity measures are hard to find at the worker level and are more relevant at the firm level (Vandenberghe 2013). We therefore use a firm-level productivity measure. Two methods are considered in this setting.

The first method is the technique developed by Hellerstein et al. (1999), which consists in estimating two regressions. The dependent variables of these are respectively the average firm productivity and the average firm wage. The explanatory variables are identical in both equations and include the percentage of hours worked by a certain type of worker in a firm as well as control variables related to workers, firm and job characteristics. This method ensures the comparability between the coefficients of the two equations, as the explanatory variables are rigorously identical. It further allows to compare average productivity to average wage from one group of workers to another and to test whether these differentials are significantly different from each other.

The second technique has been introduced by Bartolucci (2014) and improves on the first one by relying on a single wage equation at the firm level, including the percentage of hours worked by a certain type of worker, control variables and a direct measure of productivity. Hence, migrants are subject to wage discrimination if the estimator related to their presence in the workforce is significantly negative.

The Bartolucci technique provides several advantages in comparison with that of Hellerstein et al. (Bartolucci 2014). First, it avoids the specification of the functional form of the production function equation. Second, it neither assumes perfect competition in the labour market nor a linear relationship between wages and productivity, thus allowing for nonunitary wage-productivity elasticities. Finally, it produces a measure of ethnic wage discrimination that is robust to labour market segregation. We refer to Bartolucci (2014) for the proofs of these properties. Our estimations will be based on this technique, and we will thus regress the following equation:

$$log(w_{j,t}) = \beta_0 + \beta_1 I_{j,t} + \beta_2 log(p_{j,t}) + \beta_3 X_{j,t} + \delta_t + \varepsilon_{j,t} \quad (1)$$

where $log(w_{j,t})$ is the logarithm of the average gross hourly wage in firm j at time t; $I_{j,t}$ is the average share of hours worked by migrants and β_1 is the parameter that captures potential wage discrimination; $log(p_{j,t})$ is the logarithm of the average hourly added value; $X_{j,t}$ is a vector containing a set of observable characteristics of firm j and its workforce at time t; δ_t is a set of 11 year dummies and $\varepsilon_{j,t}$ is the error term.

Our variable of interest, $I_{j,t}$, is meant to estimate the effect of a higher share of hours worked by migrants on firms' average wages. We first consider the migrant population as a whole, i.e. all migrant workers born outside EU15 countries. A significant negative β_1 would suggest ethnic wage discrimination, in the sense that an increase of the share of hours worked by non-EU15 workers would decrease the mean wage – at given productivity. Second, and in order to control for potential heterogeneity related to the region of birth, we divide $I_{j,t}$ into six categories of workers: Africans, North-Western Asians, Asians, Eastern Europeans, Northern and Latin Americans, and finally workers from the South Pacific region or of other origins. Third, we divide our migrant population into three groups depending on the workers' tenure: up to 4 years, from 5 to 9 years, and more than 9 years. A decrease of β_1 through years of tenure would support statistical and/or monopsonistic discrimination theories. Finally, we test whether ethnic wage discrimination might depend on product market competition, as approached by four variables: i) the market share of the eight largest firms in the sector, ii) the Herfindahl-Hirschmann index (HHI), iii) the price-cost margin, and iv) the market share volatility of the four largest firms in the sector. We then run equation (1) for two different groups of firms, i.e. one group facing strong competition on the product market and another group facing medium or low competition, on the basis of each of the 4 preceding criteria. The sign of β_1 in the case of different product market competition situations is not straightforward. On the one hand, if Becker's idea prevails, we expect $\beta_1$to be lower when product market competition is high. On the other hand, if the assumption of imperfections in the labour market prevails, β_1 is not expected to depend on the level of product market competition.

3.2 Estimation techniques

First, we estimate equation (1) with pooled OLS. However, resulting estimates could introduce a potential heterogeneity bias, since wages and firm productivity can be linked to unobserved time-invariant firm characteristics. More precisely, unobserved fixed firm characteristics may simultaneously affect wages, productivity, and the composition of their workforce. A way to control for these unobserved time-invariant characteristics is to use a first-difference model.

However, this kind of model does not address the potential endogeneity of the workforce. For example, variations in firms' productivity can affect the composition of the workforce. To address these heterogeneity bias and endogeneity problems, we finally use a GMM-IV specification in first differences with instrumental variables (Black and Lynch 2001; Dearden et al. 2006). Following van Ours and Stoeldraijer (2011) and Göbel and Zwick (2012), we instrument first-differenced shares of hours worked by migrants with their lagged levels. The implicit assumption is that changes in wages in one period, although possibly correlated with contemporaneous variations in the share of hours worked by migrants, are uncorrelated with the lagged levels of the latter. Moreover, changes in shares of hours worked by migrants are assumed to be sufficiently correlated with their past levels.

4 Descriptive statistics

4.1 Dataset

Our first econometric regressions are based on matched employer-employee data, coming from 3 large datasets covering the 1999-2010 timespan. The first one is the Structure of Earnings Survey (SES), which provides information about firms operating in Belgium that are ranked between sectors C to K of the NACE nomenclature (Revision 2). This survey is built upon information given by the human resource departments of the studied companies. It gives details about firms' characteristics on the one hand (e.g. sector of activity, level of collective wage bargaining, firm size), and workers' characteristics on the other (e.g. age, level of education, tenure, wage). Our gross hourly wages dependent variable is calculated by dividing total gross wages, including premia for overtime, weekend or night work, bonuses and other premia, by the total number of effective paid hours. We use the worker mean gross wage rather than the mean labour cost in order to examine wage discrimination as closely as possible from the migrant's perspective rather than from the firm's. The SES has been merged with a second dataset called the Structure of Business Survey (SBS), which contains financial information about firms, such as added value and gross operating surplus per hour. This provides our direct measure of firm productivity, the average hourly added value, which corresponds to the total added value computed at factor cost divided by the total number of effective paid hours. The third dataset is the National Register, which gives precise information about workers' countries of birth.

The three above-mentioned samples have been merged by Statistics Belgium and result in an unbalanced panel of 13,631 firms and 836,937 workers during the 1999-2010 timespan, which is representative of medium and large firms in the Belgian private sector. Our analysis of potential wage discrimination against six subgroups of migrants is based on this panel.

4.2 Whole sample and migrants' countries of origin

Table 1 presents descriptive statistics about firms in column (1) and workers in columns (2) to (4). At the firm level, we first observe that the mean hourly wage reaches 15.5 euros and that the average hourly added value, which is our direct productivity measure, is estimated at 62.3 euros. Turning to our variable of interest, Table 1 shows that 91.6% of hours are worked by EU15 workers and that the different shares of worked hours amongst migrants are distributed as follows: Africans (3.3%), North-Western Asians (1.1%), Asians (0.6%), Eastern European (1.0%), Northern and Latin Americans (0.4%), and workers from South Pacific or other origins (2.0%).

As far as our firm-level control variables are concerned, 68.1% of workers possess at least a secondary education degree, and 60.2% are aged between 30 and 49. Nearly 30% are women, and slightly more than 30% of workers have been working in the same firm for at least 10 years. On average, firms employ 131 full-time equivalent workers, most are operating in the manufacturing, wholesale and retail trade and in the real estate, rental and business services sectors. Additional firm-level collective bargaining takes place in nearly 20% of firms, and a majority of firms are located in Flanders.

To examine potential differences between EU15 and non-EU15 workers, we show their respective means in columns (2) and (3). Regarding the individual-level differences between our two main workers categories, EU15 workers are employed in firms with higher average wage and higher average productivity than those of firms where non-EU15 workers are employed. Non-EU15 workers have a lower level of education, are slightly younger, have less years of tenure and are more likely to be blue-collar, part-time workers and to have fixed-term contracts. Non-EU15 workers are also more

concentrated in the construction, hotels and restaurants and real estate, renting and business services sectors, while being less numerous in the manufacturing sector. They also tend to work in smaller firms and to be less covered by a firm-level collective agreement.

4.3 Tenure across EU15 and non-EU15 workers

Table 2 shows descriptive statistics for workers divided into 3 categories of tenure (up to 4 years, from 5 to 9 years, at least 10 years). We can observe that, respectively to hours worked by EU15 workers, 45.5%, 21% and 33.5% of them are worked by workers with low, medium and high tenure, while comparatively to the total of hours worked by non-EU15 workers, 59.5%, 21.4% and 19.1% of hours are worked by colleagues with low, medium or high tenure. So, heterogeneity appears in the distribution of hours worked by years of tenure across migrant and native workers, where more (less) hours being worked by non-EU15 workers with up to 4 years of tenure (at least 10 years of tenure) compared to their EU15 colleagues.

Table 1
Firm- and worker-level descriptive statistics

Variables	Firm level	Worker level		
	Total	Workers born in EU15 countries	Workers born in non-EU15 countries	Total
Hourly wage (at 2004 constant prices)	15.5	16.5	15.4	16.4
Hourly added value (at 2004 constant prices)	62.3	56.7	52.8	56.4
Share of hours worked in firm by workers born in (%):				
EU15 countries	91.6	100		92.1
Belgium	86.3	94.3		86.8
Western Europe	5.3	5.7		5.2
Non-EU15 countries	8.4		100	7.9
Africa	3.3		43	3.4
North-Western Asia	1.1		12.9	1.0
Asia	0.6		7.0	0.6
Eastern Europe	1.0		11.2	0.9
Northern and Latin America	0.4		4.5	0.3
South Pacific and other	2.0		21.4	1.7
Worker and job characteristics (%)				
No degree, primary/lower secondary	31.9	29.6	39.2	30.3
General upper secondary, technical/artistic/professional upper secondary	43.2	43.6	38.3	43.2
Higher non university, university and post graduate	24.9	26.9	22.6	26.5
Open-term contracts	96.3	93.7	93.8	93.7
Fixed-term contracts	3.0	3.6	5.0	3.7
Interim contracts	0.4	2.5	1.1	2.4
Apprenticeship contracts	0.3	0.2	0.1	0.2
Part-time work	18.4	18.4	22.7	18.7
Blue-collar work	53.6	48.7	57.8	49.4
High tenure (>10 years)	32.6	38.4	30.7	37.8
Workers younger than 30 years	22.4	22.5	23.3	22.5
Workers between 30 and 49 years	60.2	59.9	60.6	60.0
Workers older than 49 years	17.4	17.6	16.2	17.5
Women	28.5	30.0	30.4	30.1
Firm characteristics (%)				
Mining and quarrying (NACE C)	0.4	9.3	9.8	9.4
Manufacturing (NACE D)	42.0	34.8	30.7	34.5
Electricity, gas and water supply (NACE E)	0.3	0.4	0.1	0.4
Construction (NACE F)	11.1	1.1	1.6	1.1
Wholesale and retail trade (NACE G)	20.4	3.7	3.3	3.6
Hotels and restaurants (NACE H)	2.9	0.7	3.3	0.9
Transport, storage and communication (NACE I)	8.1	3.0	2.9	3.0
Financial intermediation (NACE J)	1.2	0.9	0.8	0.9
Real estate, renting and business services (NACE K)	13.5	3.0	4.4	3.1
Firm size	131.3	302.5	288.4	301.4
Firm-level collective agreement	18.6	27.5	23.7	27.2
Region (%)				
Brussels	15.0	16.2	24.2	16.8
Flanders	60.0	58.2	49.1	57.5
Wallonia	25.0	25.6	26.7	25.6
Number of observations	13,631	773,312	63,625	836,937

Data source: SES-SBS-National Register 1999-2010

Table 2
Firm-level descriptive statistics by tenure

	Firm level		
Variables	Workers born in EU15 countries	Workers born in non-EU15 countries	Total
Share of hours worked in firm by workers born in UE15 countries (%) with:	**100**		
Up to 4 years of tenure	45.5		41.7
From 5 to 9 years of tenure	21		19.2
At least 10 years of tenure	33.5		30.7
Share of hours worked in firm by workers born outside UE15 countries (%) with:		**100**	
Up to 4 years of tenure		59.5	5.0
From 5 to 9 years of tenure		21.4	1.8
At least 10 years of tenure		19.1	1.6
Number of observations	13,621	13,621	13,621

Data source: SES-SBS-National Register 1999-2010

4.4 Do EU15 and non-EU15 workers work in unequally competitive firms?

In order to test the effect of product market competition on wage discrimination against migrants, we merged a fourth dataset to the previous ones. This fourth dataset, called Overview sector Indicators Data AGORA-MMS Project, is provided by Statistics Belgium and gathers information about sectoral competition levels faced by each firm of our sample based on their 3-digit level NACE code. Table 3 presents our new sample that contains 7,895 firms covering 633,610 workers. We obtain a reduced sample because AGORA-MMS Project does not give full information about some of the firms included in our first database.

As for the four variables related to competition at the firm-level, the average market share of the eight largest firms per sector amounts to 34%, the average HHI stands at 0.04, the average price-cost margin is equal to 5%, and the market share volatility index of the four largest firms per sector is 0.21.

Turning to descriptive statistics at the worker level, thanks to *t-test* results, we can say that non-EU15 workers tend to be employed in sectors where on average the eight largest firms in the sector possess a slightly smaller market share and the HHI is smaller, in other words where product market competition is higher and where the volatility index of the market share of the four largest firms in the sector is lower.

5. Results

5.1 Wage discrimination against migrants, regardless of their origins

Table 4 presents our estimations of wage discrimination against migrants when we do not take the potential heterogeneity among them into account. We first estimate equation (1) using pooled OLS only and including year dummies as control variables (see column (1)). The gross wage differential is estimated to be -0.24, which means that a 10-percentage-point increase in the share of hours worked by migrants is associated with a 2.4% decrease of the hourly wage across Belgian firms. We then successively add human capital variables (i.e. education, tenure, and age – column (2)), gender and job characteristics (i.e. the share of fixed-term, apprenticeship and interim contracts, of part-time workers,

Table 3
Firm- and worker-level descriptive statistics with respect to product market competition

	Firm level	Worker level		
Variables	Total	Workers born in EU15 countries	Workers born in non-EU15 countries	Total
Competition variables				
Market share of the eight largest firms in the sector (%)	0.34	0.38	0.35	0.38
Herfindahl-Hirschmann Index	0.04	0.05	0.04	0.05
Price-cost margin	0.05	0.06	0.06	0.06
Volatility index of the market share of the four largest firms in the sector	0.21	0.20	0.18	0.20
Number of observations	7,895	585,163	48,447	633,610

Data source: SES-SBS-National Register-AGORA MMS Project 1999-2010

and of blue-collar workers – column (3)), firm characteristics (i.e. region, sectoral affiliation, size in full-time equivalent, and firm-level collective agreement – column (4)) and added value (column (5)) in order to reproduce the full Bartolucci model. As we include additional control variables, the wage differential progressively drops down to 2.8%. Interestingly, the inclusion of human capital variables also generates the most substantial rise in the adjusted R^2, suggesting that an important proportion of the wage gap between native and migrant workers is associated with significant human capital discrepancies. Yet, wage differentials from OLS (3) to OLS (4) also suggest segregation of migrants in lower paid jobs and industries.

Be that as it may, these results are subject to several methodological limitations. First, they do not take time-invariant workplace characteristics into account. We therefore computed first-difference (FD) estimates. As shown in column (6), the results still produce a significant negative coefficient for the share of hours worked by non-EU15 workers. The estimated magnitude of wage discrimination against non-EU15 workers in this case stands at 6.1%.

Next, we used GMM-FD estimates (column (7)). These estimates not only take firm-level fixed effects into account through their specification in first differences but also address the potential endogeneity of the share of hours worked by non-EU15 workers by using the one- year lagged level of this variable as instrument. Applying GMM-FD yields a significant coefficient, almost equal to that obtained with the first-difference model (-5.8%). Our Kleibengern-Paap under- and overidentification tests suggest that our instruments are not weak and that the model is correctly identified. Moreover, the endogeneity test indicates that the share of hours worked by non-EU15 workers can be treated as exogeneous (*p*-value of 0.79), which means that the first-difference model should be preferred.

5.2 What about migrants' countries of birth?

Table 5 reproduces Table 4 with models that now allow to observe the respective effects of the share of hours worked by non-EU15 workers depending on the region (6 regions considered) where these workers were born. OLS (1) estimates only controlling for time dummies show substantial wage differentials across workers born in non-EU15 countries. The largest wage penalties (respectively -41 and -32%) are recorded for workers from Eastern Europe and Western Asia. In contrast, workers born in Northern and Latin America are found to earn bonuses of 70% compared to those born in EU15 countries, this result being driven by Northern Americans.

Table 4
Firm-level wage-setting equations
Workers born in non-EU15 countries taken as a whole

Log of hourly wage	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	FD (6)	GMM-FD (7)
Share of hours worked by:							
Workers born in EU15 countries	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Workers born in non-EU15 countries	-0.235*** (0.014)	-0.052*** (0.012)	-0.046*** (0.011)	-0.036*** (0.011)	-0.028*** (0.010)	-0.061*** (0.010)	-0.058*** (0.014)
Control variables							
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Human capital[A]	No	Yes	Yes	Yes	Yes	Yes	Yes
Gender and job characteristics[B]	No	No	Yes	Yes	Yes	Yes	Yes
Firm characteristics[C]	No	No	No	Yes	Yes	-	-
Added value	No	No	No	No	Yes	Yes	Yes
Adjusted R^2	0.061	0.513	0.557	0.615	0.671	0.646	0.646
Underidentification test[D]							0.00
Weak identification test[E]							1.1e+04
Endogeneity test[F]							0.792
Number of observations	13,631	13,631	13,631	13,631	13,631	13,631	13,631
Sig. Model (*p*-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Data source: SES-SBS-National Register 1999-2010; Robust standard errors in brackets
***, **, * significant at 1, 5 and 10% levels, respectively

[A] Educational levels (2 dummies for the share of hours worked by workers with a general upper secondary, technical/artistic/professional upper secondary degree and workers with higher non university, university and post graduate degree, workers with no degree, primary/lower secondary degree being the reference category), tenure (1 dummy for the share of hours worked by workers with at least 10 years of tenure), age categories (2 dummies for the share of hours worked by workers aged between 30 and 49 and workers over 49, workers under 30 being the reference category).

[B] Gender (1 dummy for the share of hours worked by females, males being the reference category), work contract (3 dummies for the share of hours worked by workers under a fixed-term contract, apprenticeship contract and interim contract, workers under an open-term contract being the reference category), worker category (1 dummy for the share of hours worked by blue-collar workers, white-collars being the reference category) and work regime (1 dummy for the share of hours worked by part-time workers, full-time workers being the reference category).

[C] Sectors of activities (8 dummies, manufacturing being the reference category), level of wage bargaining (1 dummy for the presence of a collective agreement at the firm level), number of full-time equivalent workers, location (2 dummies for Brussels and Wallonia, Flanders being the reference category).

[D] Underidentification test reports *p*-value of Kleibergen-Paap rk LM statistic.

[E] Weak identification test reports Kleibergen-Paap rk Wald F statistic.

[F] Chi^2 *p*-value of the endogeneity test.

Table 5
Firm-level wage-setting equations
Workers born in non-EU15 countries, divided by regions of birth

Log of hourly wage	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	FD (6)	GMM-FD (7)
Share of hours worked by workers born in:							
EU15 countries	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Africa	-0.254***	-0.067***	-0.074***	-0.079***	-0.044***	-0.070***	-0.088***
	(0.021)	(0.018)	(0.018)	(0.017)	(0.015)	(0.016)	(0.022)
North-Western Asia	-0.319***	0.021	0.030	0.001	0.0001	0.017	0.032
	(0.028)	(0.024)	(0.024)	(0.023)	(0.023)	(0.024)	(0.032)
Asia	-0.255***	-0.198***	-0.180***	-0.078*	-0.072*	-0.175***	-0.132**
	(0.060)	(0.043)	(0.042)	(0.041)	(0.037)	(0.039)	(0.051)
Eastern Europe	-0.403***	-0.142***	-0.100***	-0.084***	-0.068***	-0.120***	-0.112***
	(0.041)	(0.033)	(0.030)	(0.029)	(0.025)	(0.027)	(0.039)
Northern and Latin America	0.699**	0.243**	0.276***	0.301***	0.231***	0.160**	0.098
	(0.156)	(0.104)	(0.101)	(0.097)	(0.087)	(0.066)	(0.088)
South Pacific and other countries	-0.199***	-0.022	-0.020	-0.013	-0.022	-0.059***	-0.043
	(0.031)	(0.024)	(0.023)	(0.023)	(0.022)	(0.020)	(0.029)
Control variables							
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Human capital[A]	No	Yes	Yes	Yes	Yes	Yes	Yes
Gender and job characteristics[B]	No	No	Yes	Yes	Yes	Yes	Yes
Firm characteristics[C]	No	No	No	Yes	Yes	-	-
Added value	No	No	No	No	Yes	Yes	Yes
Adjusted R^2	0.068	0.514	0.558	0.616	0.671	0.647	0.647
Underidentification test[D]							0.00
Weak identification test[E]							1459.012
Endogeneity test[F]							0.6083
Number of observations	13,631	13,631	13,631	13,631	13,631	13,631	13,631
Sig. Model (*p*-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Data source: SES-SBS-National Register 1999-2010; Robust standard errors in brackets
***, **, * significant at 1, 5 and 10% levels, respectively

[A] Educational levels (2 dummies for the share of hours worked by workers with a general upper secondary, technical/artistic/professional upper secondary degree and workers with higher non university, university and post graduate degree, workers with no degree, primary/lower secondary degree being the reference category), tenure (1 dummy for the share of hours worked by workers with at least 10 years of tenure), age categories (2 dummies for the share of hours worked by workers aged between 30 and 49 and workers over 49, workers under 30 being the reference category).

[B] Gender (1 dummy for the share of hours worked by females, males being the reference category), work contract (3 dummies for the share of hours worked by workers under a fixed-term contract, apprenticeship contract and interim contract, workers under an open-term contract being the reference category), worker category (1 dummy for the share of hours worked by blue-collar workers, white-collars being the reference category) and work regime (1 dummy for the share of hours worked by part-time workers, full-time workers being the reference category).

[C] Sectors of activities (8 dummies, manufacturing being the reference category), level of wage bargaining (1 dummy for the presence of a collective agreement at the firm level), number of full-time equivalent workers, location (2 dummies for Brussels and Wallonia, Flanders being the reference category).

[D] Underidentification test reports *p*-value of Kleibergen-Paap rk LM statistic.

[E] Weak identification test reports Kleibergen-Paap rk Wald F statistic.

[F] Chi^2 *p*-value of the endogeneity test.

Once again, we controlled for all covariates, firms' unobservable fixed effects, and potential endogeneity. Focusing first on GMM-FD estimates and more precisely on the endogeneity test, we still consider our variables of interest as exogenous (p-value equal to 0.71). We also observe that our GMM-FD model is correctly identified and that our instrumental variables are not weak. Accordingly, we still conclude that our preferred model is the FD specification. Our FD estimates, reported in column (6), show that four out of the six subgroups of migrant workers are paid significantly less than equally productive workers born in EU15 countries. Wage discrimination ranges respectively between -17.5% against Asians, -12% against Eastern Europeans, -7% against Africans, and -5.9% against workers born in South Pacific (and other regions). Note that, subdividing the African group further into Northern Africans and Sub-Saharan Africans, we obtain a significant estimator of wage discrimination (-8.3%) against North Africans but a non-significant one against Sub-Saharan African. In contrast, a still positive and significant wage discrimination coefficient of 16% remains in favour of Americans. Interestingly, we also find that the coefficient for North-Western Asians is not significant.

5.3 A vanishing effect of tenure?

To test whether wage discrimination against migrants decreases with tenure, we divided our migrant population between workers with up to 4 years of tenure, with 5 to 9 years of tenure, and with at least 10 years of tenure. We then compared whether and how wage discrimination varies between those 3 groups in comparison with the entire population of EU15 workers. Statistical tests indicate that our model is not underidentified and that our instruments are not weak. However, we have to reject the null hypothesis that our variables are exogenous (p-value of the endogeneity test equal to 0.0558) and thus to consider GMM-FD results as presented in Table 6.

Controlling for the average level of workers' tenure within their firms, our preferred results estimate a wage discrimination of 6% against migrant workers (born in non-EU15 countries) with up to 4 years of tenure in comparison with all native workers. In other words, an increase of 10 percentage points of migrant workers with up to 4 years of tenure will decrease mean wages by 6%. However, no significant wage discrimination seems to remain against non-EU15 workers with more than 4 years of tenure, which supports that wage discrimination vanishes with tenure, as suggested by the statistical and monopsonistic discrimination arguments. Moreover, it is quite interesting to observe that only 4 years of tenure seem sufficient for this discrimination to disappear.

5.4 Product market competition: Becker or imperfect labour market theories?

We now test whether the magnitude of wage discrimination against non-EU15 workers depends on the degree of product market competition faced by their employers. To do so, we estimate equation (1) separately for firms facing high *vs.* medium or low product market competition, based on four different sectoral indicators of product market competition. We assume that firms face high (medium or low) product market competition if their sectoral product market competition indicator is lower (higher) than the 33rd percentile of the corresponding indicator of the whole sample. We obtain a first set of firms evolving in a highly competitive product market environment (around 2600) and a second sample of (around 5300) firms facing medium or low product market competition. As we have to rely on FD and GMM-FD estimators that require additional restrictions, these samples are then further reduced. Table 7 shows our preferred estimates for both samples of firms and depending on the different product market competition indicators under consideration. The choice of preferred estimates still depends on whether the null hypothesis of exogeneity of the share of hours worked by non-EU15 workers should be rejected or not. Full results are available on request.

Table 6
Firm-level wage-setting equation
GMM-First-difference results by tenure

Dependent variable: Log of hourly wage	
Share of hours worked by workers born in:	
EU15 countries	Ref.
Non-EU15 countries with up to 4 years of tenure	-0.060*** (0.020)
Non-EU15 countries with 5 to 9 years of tenure	-0.002 (0.033)
Non-EU15 countries with at least 10 years of tenure	-0.034 (0.042)
Control variables	
Year dummies	Yes
Human capital[A]	Yes
Gender and job characteristics[B]	Yes
Firm characteristics[C]	-
Added value	Yes
Adjusted R^2	0.650
Underidentification test[D]	0.00
Weak identification test[E]	3328.356
Endogeneity test[F]	0.0558
Number of observations	13,621
Sig. Model (*p*-value)	0.00

Data source: SES-SBS-National Register-Statistics Belgium 1999-2010; Robust standard errors in brackets

[A] Educational levels (2 dummies for the share of hours worked by workers with a general upper secondary, technical/artistic/professional upper secondary degree and workers with higher non university, university and post graduate degree, workers with no degree, primary/lower secondary degree being the reference category), tenure (1 dummy for the share of hours worked by workers with at least 10 years of tenure), age categories (2 dummies for the share of hours worked by workers aged between 30 and 49 and workers over 49, workers under 30 being the reference category)

[B] Gender (1 dummy for the share of hours worked by females, males being the reference category), work contract (3 dummies for the share of hours worked by workers under a fixed-term contract, apprenticeship contract and interim contract, workers under an open-term contract being the reference category), worker category (1 dummy for the share of hours worked by blue-collar workers, white-collars being the reference category) and work regime (1 dummy for the share of hours worked by part-time workers, full-time workers being the reference category).

[C] Sectors of activities (8 dummies, manufacturing being the reference category), level of wage bargaining (1 dummy for the presence of a collective agreement at the firm level), number of full-time equivalent workers, location (2 dummies for Brussels and Wallonia, Flanders being the reference category)

[D] Underidentification test reports *p*-value of Kleibergen-Paap rk LM statistic

[E] Weak identification test reports Kleibergen-Paap rk Wald F statistic

[F] Chi^2 *p*-value of the endogeneity test

Table 7
Firm-level wage-setting equation
Preferred estimates for non-EU15 workers, considered as a whole, depending on firm product market competition

Dependent variable: Log of hourly wage	**Competition estimator**	**Market share of the first 8 firms in the sector**	**Herfindahl-Hirschmann Index**	**Price-cost Margin**	**Market share volatility of the first 4 firms in the sector**
High product market competition	Non-EU15[A]	-0.060* (0.031)	-0.018 (0.033)	-0.011 (0.041)	0.012 (0.038)
	Adjusted R^2	0.644	0.647	0.629	0.636
	Number of observations	913	856	842	922
	Sig. Model (*p*-value)	0.00	0.00	0.00	0.00
Medium or low product market competition	Non-EU15[A]	-0.093*** (0.027)	-0.058*** (0.020)	-0.063*** (0.017)	-0.089*** (0.018)
	Adjusted R^2	0.646	0.640	0.655	0.654
	Number of observations	3,513	3,608	3,667	3,351
	Sig. Model (*p*-value)	0.00	0.00	0.00	0.00
Control variables					
Year dummies	Yes	Yes	Yes	Yes	Yes
Human capital[B]	Yes	Yes	Yes	Yes	Yes
Gender and job characteristics[C]	Yes	Yes	Yes	Yes	Yes
Firm characteristics[D]	-	-	-	-	-
Added value	Yes	Yes	Yes	Yes	Yes

Data source: SES-SBS-National Register-AGORA MMS Project 1999-2010; Robust standard errors in brackets
***, **, * significant at 1, 5 and 10% levels, respectively

[A] Educational levels (2 dummies for the share of hours worked by workers with a general upper secondary, technical/artistic/professional upper secondary degree and workers with higher non university, university and post graduate degree, workers with no degree, primary/lower secondary degree being the reference category), tenure (1 dummy for the share of hours worked by workers with at least 10 years of tenure), age categories (2 dummies for the share of hours worked by workers aged between 30 and 49 and workers over 49, workers under 30 being the reference category).

[B] Gender (1 dummy for the share of hours worked by females, males being the reference category), work contract (3 dummies for the share of hours worked by workers under a fixed-term contract, apprenticeship contract and interim contract, workers under an open-term contract being the reference category), worker category (1 dummy for the share of hours worked by blue-collar workers, white-collars being the reference category) and work regime (1 dummy for the share of hours worked by part-time workers, full-time workers being the reference category).

[C] Sectors of activities (8 dummies, manufacturing being the reference category), level of wage bargaining (1 dummy for the presence of a collective agreement at the firm level), number of full-time equivalent workers, location (2 dummies for Brussels and Wallonia, Flanders being the reference category).

[D] Sectors of activities (9 dummies, reference), level of wage bargaining (1 dummy), number of full-time equivalent workers, location (2 dummies).

For our sample of firms operating in highly competitive markets, our preferred estimates show that the coefficient for the share of hours worked by non-EU15 workers is not statistically significant with three out of the four competition indicators used, namely the HHI, price-cost margin, and market share volatility indices. Put differently, in three out of four cases, results suggest the absence of wage discrimination when competition is higher. It is only when we consider the fourth indicator, i.e. the market share of the eight largest firms in the sector, that a wage discrimination of 6% seems to persist. The results are radically different for firms facing medium or low competition: these firms show substantial wage discrimination against non-EU15 workers in all models, ranging from 6% to 9%

depending on the considered competition indicator. Thus, these results are in line with Becker's theory suggesting that wage discrimination decreases or even disappears as product market competition increases.

We repeated these estimations of wage discrimination against migrants depending on product market competition with three subgroups of migrant workers (see results in Appendix Table A.4). Overall, we find wage discrimination against workers born in Africa, Asia and Eastern Europe when those workers are employed in firms operating in medium or low competition environments, whereas there seems to be no significant wage penalty for those workers when they are employed in firms facing strong competition. Again, our results are more in line with Becker's predictions.

6 Conclusion

Immigration has become a major challenge for societies over time. Particularly, the situation of migrants in the labour market is worse than that of native workers, leading to a higher risk of poverty characterizing the migrant population. In this context, this paper aims to analyse wage discrimination against migrants on the Belgian private labour market, by differentiating subgroups of migrants on the basis of their countries of birth, their tenure and firm product market competition. In order to achieve these objectives, we take advantage of our access to a large matched employer-employee panel sample for the years 1999-2010, which covers a large part of the Belgian private sector and provides accurate information on workers (i.e. gender, education, tenure, age, and country of birth) as well as on firms (i.e. wage, added value, firm size, firm bargaining level, sector, and sectorial product market competition).

The originality of this paper is fivefold. First, we use a direct productivity measure at the firm level to tackle ethnic wage discrimination. Indeed, only a few studies include firm-level productivity measures in their empirical tests. Second, we use a rather new econometric method brought by Bartolucci (2014), which estimates wages in relation with the share of hours worked by migrants, labour productivity, and control variables associated to worker, job, and firm characteristics. This technique offers several advantages with respect to the previous ones generally used to tackle ethnic wage discrimination. Third, we divide our migrant population into different subgroups by countries of birth. As this population seems quite heterogeneous, we investigate whether and to what extent wage discrimination varies across groups of migrants in Belgium. Fourth, we test the effect of tenure on wage discrimination against migrants. This enables us to investigate whether potential wage discrimination decreases or even vanishes as workers' tenure increases. Fifth, we investigate the role played by product market competition by considering four different indicators. Thereby, we also aim at testing the relevance of Becker's theory compared to alternative theories to predict the wage-setting behaviour of firms in different product market competition situations.

Controlling for a wide range of worker and firm characteristics, as well as firms' unobserved time-invariant heterogeneity and potential endogeneity in the composition of the workforce, our preferred estimates support the presence of wage discrimination in the order of 6.1% against non-EU15 workers considered as a whole. When distinguishing these workers by their regions of birth, we find that wage discrimination is the most significant against Asians (17.5%) and Eastern Europeans (12%), somewhat lower against Africans (7%) and people born in the South Pacific region (5.9%), and non-significant for North-Western Asians. They confirm the adequacy of dividing non-EU15 workers into subgroups, as they appear to be treated very differently in the Belgian labour market depending on their regions of birth.

In addition, our results show that wage discrimination against migrants vanishes as their firm-specific labour market experience increases. Indeed, negative and statistically significant estimates of wage discrimination against migrants born outside EU15 countries with low tenure tend to disappear when these migrants' tenure exceeds 4 years. This is in line with statistical and monopsonistic discrimination theories, according to which employers pay their employees based on their productivity once they can learn about it and when employees' bargaining power to negotiate equal wages gets higher.

Furthermore, we also estimate that the magnitude of wage discrimination against migrant workers decreases and becomes generally non-significant when firms operate in highly competitive product market environments. These findings are robust to the use of four different product market competition indicators and are in line with Becker's theory, according to which discrimination is present only in firms operating in lower product market competition environments.

Ultimately, our results also support that, despite Belgian's anti-discrimination legislation, a substantial part of observed wage differentials between EU15 and non-EU15 workers remains unexplained after controlling for differences in productivity, and that the magnitude of wage discrimination against migrants heavily depends upon their countries of birth, their tenure, and on the degree of product market competition faced by their employers.

References

Aeberhardt R, Pouget J (2010) National origin differences in wages and hierarchical positions. Annals of Economics and Statistics 99(100):117–139.

Agesa J, Agesa RU, Hoover GA (2001) Market structure and racial earnings: evidence from job-changers. American Economic Review 91(2):169–173.

Arrow K (1973) The Theory of discrimination. Discrimination in the Labour Market 3(10):3–33.

Aydemir A, Skuterud M (2005) Explaining the deteriorating entry earnings of Canada's immigrant cohorts, 1966 – 2000. Canadian Journal of Economics/Revue Canadienne d'économique 38(2):641–672.

Aydemir A, Skuterud M (2008) The Immigrant Wage Differential within and across Establishments. ILR Review 61(3):334–352.

Baert S, Cockx B (2013) Pure ethnic gaps in educational attainment and school to work transitions: When do they arise? Economics of Education Review 36:276–294.

Barrett A, McGuinness S, O'Brien M (2012) The Immigrant Earnings Disadvantage across the Earnings and Skills Distributions: The Case of Immigrants from the EU's New Member States: The Immigrant Earnings Disadvantage. British Journal of Industrial Relations 50(3):457–481.

Bartolucci C (2014) Understanding the Native–Immigrant Wage Gap Using Matched Employer-Employee Data: Evidence from Germany. ILR Review 67(4):1166–1202.

Bayard K, Hellerstein J, Neumark D, Troske K (1999) Why Are Racial and Ethnic Wage Gaps Larger for Men than for Women? Exploring the Role of Segregation Using the New Worker-Establishment Characteristics Database. In: Haltiwanger J, Lane J, Spletzer J, Theeuwes J, Troske K (eds) The Creation and Analysis of Employer-Employee Matched Data. Elsevier, pp 175-203.

Becker GS (1957) The Theory of Discrimination: an economic view of racial discrimination. University of Chicago: Chicago.

Belfield C, Heywood JS (2006) Product market structure and gender wage discrimination in the United Kingdom. In: Heywood JS, Peoples J (eds) Product Market Structure and Labor Market Discrimination. State University of New York Press, pp 39-58.

Berik G, Rodgers YVDM, Zveglich JE (2004) International Trade and Gender Wage Discrimination: Evidence from East Asia. Review of Development Economics 8(2):237–254.

Berson C (2011) Concurrence imparfaite et discrimination sur le marché du travail. Revue économique 62(3):409–417.

Black DA (1995) Discrimination in an Equilibrium Search Model. Journal of Labor Economics 13(2):309–334.

Black SE, Brainerd E (2004) Importing Equality? The Impact of Globalization on Gender Discrimination. ILR Review 57(4):540–559.

Black SE, Lynch LM (2001) How to Compete: The Impact of Workplace Practices and Information Technology on Productivity. Review of Economics and Statistics 83(3):434–445.

Black SE, Strahan PE (2001) The Division of Spoils: Rent-Sharing and Discrimination in a Regulated Industry. The American Economic Review 91(4):814–831.

Blinder AS (1973) Wage Discrimination: Reduced Form and Structural Estimates. The Journal of Human Resources 8(4):436–455.

Borjas GJ (1985) Assimilation, Changes in Cohort Quality, and the Earnings of Immigrants. Journal of Labor Economics 3(4):463–489.

Borjas GJ (1999) The economic analysis of immigration. In: Ashenfelter O, Card D (eds) Handbook of labor economics. North-Holland Elsevier Science, 3:1697–1760.

Borjas GJ, Katz LF (2007) Mexican immigration to the United States. University of Chicago Press: Chicago.

Bratsberg B, Ragan Jr JF (2002) The Impact of Host-Country Schooling on Earnings: A Study of Male Immigrants in the United States. Journal of Human Resources 37(1):63–105.

Carneiro A, Fortuna N, Varejão J (2011) Immigrants at new destinations: how they fare and why. Journal of Population Economics 25(3):1165–1185.

Carnevale AP, Fry RA, Lowell BL (2001) Understanding, Speaking, Reading, Writing, and Earnings in the Immigrant Labor Market. American Economic Review 91(2):159–163.

Chiswick BR (1978) The effect of Americanization on the earnings of foreign-born men. Journal of Political Economy 86(5):897–921.

Chiswick BR (1991) Speaking, Reading, and Earnings among Low-Skilled Immigrants. Journal of Labor Economics 9(2):149–170.

Chiswick BR, Le AT, Miller PW (2008) How Immigrants Fare across the Earnings Distribution in Australia and the United States. ILR Review 61(3):353–373.

Chiswick BR, Miller PW (1995) The Endogeneity between Language and Earnings: International Analyses. Journal of Labor Economics 13(2):246–288.

Cooke D, Fernandes AP, Ferreira P (2019) Product market competition and gender discrimination. Journal of Economic Behavior & Organization 157:496–522.

Daneshvary N (1993) Earnings Differentials between Natives and Immigrants with College Degree. The American Economist 37(2):46–52.

Dearden L, Reed H, Van Reenen J (2006) The Impact of Training on Productivity and Wages: Evidence from British Panel Data. Oxford Bulletin of Economics and Statistics 68(4):397–421.

Dustmann C, van Soest A (2002) Language and the Earnings of Immigrants. ILR Review 55(3):473–492.

Elliott RJR, Lindley JK (2008) Immigrant wage differentials, ethnicity and occupational segregation. Journal of the Royal Statistical Society: Series A (Statistics in Society) 171(3):645–671.

Eurostat (2019a) Immigration by group age, sex and citizenship. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=migr_imm1ctz&lang=en. Accessed 3 July 2019

Eurostat (2019b) Unemployment rates by age, sex and country of birth. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsa_urgacob&lang=en. Accessed 3 July 2019

Eurostat (2019c) Mean and medium income by broad group of country of birth (population aged 18 and over). http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_di16&lang=en. Accessed 3 July 2019

Eurostat (2019d) At-risk-of-poverty rate by broad group of country of birth (population aged 18 and over). http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_li32&lang=en. Accessed 3 July 2019

Euwals R, Dagevos J, Gijsberts M, Roodenburg H (2010) Citizenship and Labor Market Position: Turkish Immigrants in Germany and the Netherlands. International Migration Review 44(3):513–538.

Federal Public Service Employment, Labour and Social Dialogue, Unia (2017) Monitoring Socio-économique 2017 : marché du travail et origine. Bruxelles.

Ferrer A, Riddell WC, Green DA (2004) The Effect of Literacy on Immigrant Earnings. Statistics Canada: Ottawa.

Friedberg RM (2000) You Can't Take It with You? Immigrant Assimilation and the Portability of Human Capital. Journal of Labor Economics 18(2):221–251.

Gill PS (2013) Employer learning and statistical discrimination in the New Zealand labour market. Dissertation, University of Otago.

Göbel C, Zwick T (2012) Age and Productivity: Sector Differences. De Economist 160(1):35–57.

Heath A, Cheung SY (2007) Unequal Chances: Ethnic Minorities in Western Labour Markets. Oxford University Press, Oxford.

Heckman JJ (1998) Detecting Discrimination. Journal of Economic Perspectives 12(2):101–116.

Hellerstein JK, Neumark D, Troske KR (1999) Wages, Productivity, and Worker Characteristics: Evidence from Plant-Level Production Functions and Wage Equations. Journal of Labor Economics 17(3):409–446.

Hellerstein JK, Neumark D, Troske KR (2002) Market Forces and Sex Discrimination. The Journal of Human Resources 37(2):353-380.

Heyman F, Svaleryd H, Vlachos J (2013) Competition, Takeovers, and Gender Discrimination. ILR Review 66(2):409–432.

Himmler O, Jäckle R (2018) Literacy and the Migrant-Native Wage Gap. Review of Income and Wealth 64(3):592–625.

Hirsch B, Jahn EJ (2015) Is There Monopsonistic Discrimination against Immigrants? ILR Review 68(3):501–528.

Hirsch B, Oberfichtner M, Schnabel C (2012) Do women benefit from competitive markets? Product market competition and the gender pay gap in Germany. Economics Bulletin 32(2):1618–1624.

Hirsch B, Oberfichtner M, Schnabel C (2014) The levelling effect of product market competition on gender wage discrimination. IZA Journal of Labor Economics 3(19):1–14.

Juhn C, Ujhelyi G, Villegas-Sanchez C (2013) Men, Women, and Machines: How Trade Impacts Gender Inequality. Journal of Development Economics 106:179–193.

Kampelmann S, Rycx F (2016) Wage discrimination against immigrants: measurement with firm-level productivity data. IZA Journal of Migration 5(1):1–24.

Kogan I (2007) Explaining Immigrant Labour Market Inequality. In: Kogan I (ed) Working Through Barriers. Springer Netherlands, Dordrecht, pp 9–24.

McDonald JT, Worswick C (1998) The Earnings of Immigrant Men in Canada: Job Tenure, Cohort, and Macroeconomic Conditions. ILR Review 51(3):465–482.

Mincer J (1974) Schooling, experience and earnings. Colombia University Press, New York.

Nanos P, Schluter C (2014) The composition of wage differentials between migrants and natives. European Economic Review 65:23–44.

Neels K (2000) Education and the transition to employment: young Turkish and Moroccan adults in Belgium. In: Lesthaedghe R (ed) Communities and Generations – Turkish and Moroccan populations in Belgium. VUBPRESS, Brussels, pp 43–278.

Oaxaca R (1973) Male-Female Wage Differentials in Urban Labor Markets. International Economic Review 14(3):693–709.

OECD (2017) How's Life? 2017: Measuring Well-being. OECD Publishing.

Ohlert C, Beblo M, Wolf E (2016) Competition, Collective Bargaining, and Immigrant Wage Gaps Within German Establishments. Wage Inequality in Germany and the Role of Organisations, 1–28.

Peoples J, Saunders L (1993) Trucking Deregulation and the Black/White Wage Gap. ILR Review 47(1):23–35.

Peoples J, Talley WK (2001) Black–White Earnings Differentials: Privatization versus Deregulation. American Economic Review 91(2):164–168.

Peri G, Sparber C (2009) Task Specialization, Immigration, and Wages. American Economic Journal: Applied Economics 1(3):135–169.

Phelps, E. (1972) The statistical theory of racism and sexism. The American Economic Review 62(4):659–661.

Simón H, Sanromá E, Ramos R (2008) Labour segregation and immigrant and native-born wage distributions in Spain: an analysis using matched employer–employee data. Spanish Economic Review 10(2):135–168.

Sweetman A (2004) Immigrant Source Country Educational Quality and Canadian Labour Market Outcomes (Research Paper No. 234). Canada: Statistics Canada: Ottawa.

van Ours JC, Stoeldraijer L (2011) Age, Wage and Productivity in Dutch Manufacturing. De Economist 159(2):113–137.

Vandenberghe V (2013) Are firms willing to employ a greying and feminizing workforce? Labour Economics 22:30–46.

Velling J (1995) Wage discrimination and occupational segregation of foreign male workers in Germany. ZEW Discussion Papers 95(04).

Vertommen S, Martens A (2006) Ethnic Minorities Rewarded: Ethnostratification on the Wage Market in Belgium. SSRN Electronic Journal.

Weichselbaumer D, Winter-Ebmer R (2007) The effects of competition and equal treatment laws on gender wage differentials. Economic Policy 22(50):236–287.

Winter-Ebmer R (1995) Sex discrimination and competition in product and labour markets. Applied Economics 27(9):849–857.

Appendix

Table A.1: Studies on ethnic wage discrimination

Study	Country	Data/Coverage	Data level	Method	Control for direct productivity	Division of migrants by origins and results	Results
Daneshvary (1993)	US	Cross-sectional data on 9,959 college educated men, 1979	Individual	Oaxaca-Blinder	No	No	*OLS:* Earning differentials between equally productive native-born and immigrant workers. This difference of wage widens for highly educated workers.
Velling (1995)	Germany	Cross-sectional data on 230,000 individuals, 1989	Individual	Oaxaca-Blinder	No	Yes: 14 subgroups divided by current nationality. Migrants coming from Eastern Europe, Middle East and Far East countries suffer from higher wage gaps respectively to natives.	*Tobit estimation*: Total wage differential is of 13 percentage points between native and foreign males, especially coming from Eastern Europe, the Middle East and the Far East (i.e. all nationality groups with a particularly high percentage of new migrants).
Vertommen and Martens (2006)	Belgium	Cross-sectional data on 421,325 workers, June 2001	Individual	Extended Mincer	No	Yes: 18 subgroups divided by nationality at birth and current nationality	*OLS*: Having a southern origin/appearance has a negative impact on wage, and resembling the native Belgian population increases the chances of obtaining a higher pay.

Borjas and Katz (2007)	US	Longitudinal data on more than 5 million workers, 1990-2000	Individual	Mincer	No	No	*Pooled OLS*: Although the earnings of non-Mexican immigrants converge to those of their native-born counterparts as the immigrants accumulate work experience in the U.S. labor market, this type of wage convergence has been much weaker on average for Mexican immigrants than for other immigrant groups.
Aydemir and Skuterud (2008)	Canada	Panel data on 6,760 firms, 1999 and 2001	Individual and firm	Extended Mincer	No	No	*Fixed effect*: highly nonrandom sorting of immigrants across establishments within Canada's major cities and geographic regions. For immigrant men, this sorting affected wage differentials more than did differences in how immigrant and native men were paid within establishments. For immigrant women, however, particularly those from less developed world regions, within- establishment wage differentials appear to have been more important.

Chiswick et al. (2008)	Australia and USA	Cross-sectional data on 533,906 workers, 1999	Individual	Oaxaca-Blinder	No	Yes: 2 subgroups: English-speaking countries versus non-English-speaking countries divided by nationality at birth. Workers from English-speaking countries (others) earn wages 12% more (less) than natives in the U.S.	*OLS on quantile regression*: the native/immigrant earnings gap varies by decile and, for the United States case, is higher between workers working in higher wage deciles
Simón et al. (2008)	Spain	Panel data on 14,177 firms, 1999-2002	Individual and firm	Extended Oaxaca-Blinder	No	Yes: developed versus developing countries divided by current nationality. Migrants from developed countries have higher average wages when compared with native-born workers and show a wage distribution that is more dispersed than immigrants from developing countries.	*Fixed effect:* the differences in the wage structures for native-born and immigrant workers are accounted for by the differences in their observed characteristics.

Aeberhardt and Pouget (2010)	France	Cross-sectional data on 40,698 individuals, 2002	Individual and firm	Extended Oaxaca-Blinder	No	Yes: France versus Northern Africa versus Southern Europe divided according to the parents' birth place. Their results support no wage discrimination but rather occupational segregation.	*Maximum likelihood and two-step Heckman estimation methods*: wage differentials mostly reflect differences in the type of jobs taken up by individuals, according to their experience, background and education. Wage differentials explained by occupational segregation, rather than mere wage discrimination.
Carneiro et al. (2011)	Portugal	Panel data on 13.8 million workers, 2003-2008	Individual and firm	Extended Mincer	No	No	*OLS:* wage differential between migrant and native worker is due to labour market segregation.
Barrett et al. (2012)	Ireland	Cross-sectional data on about 50,000 workers, March 2006	Individual	Extended Mincer	No	Yes: UK, EU-13, New Member States, Others English-speaking, Others non-English speaking divided by nationality at birth.	*OLS on quantile regression*: the average earnings difference between New EU Members States workers and natives is between 10% and 18%, depending on the controls used. This wage gap is higher than the ones observed for other immigrant groups.

Bartolucci (2014)	Germany	Panel data on 24,943 firms, 1996-2005	Firm	Bartolucci	Yes	Yes, workers born in developed countries vs. workers born in developing countries. Workers born in developing countries are slightly less discriminated than workers born in developed countries. The wage discrimination difference between those migrant subgroups is marginally significant and is not robust to productivity variable changes.	*Fixed effect*: Discrimination against migrants ranges between 12.8% and 16.8%. The Hellerstein-Neumark approach did not give any statistically significant estimation of ethnic wage discrimination.
Kampelmann and Rycx (2016)	Belgium	Panel data on 9,430 firms, 1999-2010	Firm	Bartolucci	Yes	No	*GMM-FD:* an increase in the share of non-EU workers in a firm is correlated with a 2% decrease in the average wage paid.

Table A.2: Studies related to ethnic wage discrimination and tenure

Study	Country	Data/Coverage	Data level	Method	Control for direct productivity	Results
Gill (2013)	New Zealand	Cross-sectional data on 7,307 workers, May 2006 – May 2007	Individual	Altonji and Pierret	No	*OLS:* Evidence of statistical wage discrimination against Asian or Pasifika females decreases by 1.15% per year of tenure.
Bartolucci (2014)	Germany	Panel data on 24,943 firms, 1996-2005	Firm	Bartolucci	Yes	*Fixed effect*: No evidence of an impact of tenure on wage discrimination against migrants.

Table A.3: Studies related to ethnic wage discrimination and product market competition

Study	Country	Data/Coverage	Data level	Method	Control for direct productivity	Division of migrants by origin	Results
Peoples and Saunders (1993)	US	Cross-sectional data on 7,054 truck drivers, 1973-1988	Individual	Mincer	No	No	*OLS:* deregulation is associated with significantly declining black/white wage gaps among both union and nonunion drivers.
Peoples and Talley (2001)	US	Cross-sectional data on 1,064 public-transit bus drivers, 1973-1996	Individual	Mincer	No	No	*OLS:* Privatization in the public-transit bus sector is associated with declines in the ethnic earnings differential.
Ohlert et al. (2016)	Germany	Panel data on 9,095 firms, 2000-2010	Individual	Extended Mincer and Oaxaca-Blinder	No	No	*Fixed effect*: competition leads to a decrease in wage differentials between natives and migrants.

Table A.4: Wage discrimination against migrants divided into 3 subgroups, depending on product market competition

Firm-level wage-setting equation
Preferred results for workers born in non-EU15 countries divided into 3 subgroups, depending on market competition

Dependent variable: Log of hourly wage	**Competition estimator**	**Market share of the eight largest firms in the sector**	**Herfindahl-Hirschmann Index**	**Price-cost margin**	**Market share volatility of the four largest firms in the sector**
High product market competition	Africans[A]	-0.068 (0.075)	-0.097 (0.075)	0.016 (0.058)	0.0001 (0.063)
	Asians and Eastern Europeans[AB]	-0.076 (0.069)	-0.048 (0.075)	-0.102 (0.063)	0.034 (0.067)
	Others[AC]	0.126 (0.088)	0.115 (0.101)	0.094 (0.102)	-0.001 (0.055)
	Adjusted R^2	0.640	0.645	0.629	0.635
	Number of observations	913	856	842	922
	Sig. Model (*p*-value)	0.00	0.00	0.00	0.00
Medium or low product market competition	Africans[A]	-0.067** (0.034)	-0.068** (0.032)	-0.090*** (0.028)	-0.114*** (0.028)
	Asians and Eastern Europeans[AB]	-0.069** (0.035)	-0.095*** (0.034)	-0.052* (0.028)	-0.092*** (0.028)
	Others[AC]	-0.022 (0.034)	-0.006 (0.034)	-0.044 (0.027)	-0.049 (0.034)
	Adjusted R^2	0.646	0.640	0.655	0.654
	Number of observations	3,513	3,608	3,667	3,351
	Sig. Model (*p*-value)	0.00	0.00	0.00	0.00
Control variables					
Year dummies	Yes	Yes	Yes	Yes	Yes
Human capital[D]	Yes	Yes	Yes	Yes	Yes
Gender and job characteristics[E]	Yes	Yes	Yes	Yes	Yes
Firm characteristics[F]	-	-	-	-	-
Added value	Yes	Yes	Yes	Yes	Yes

Data source: SES-SBS-National Register-AGORA MMS Project 1999-2010; Robust standard errors in brackets

***, **, * significant at 1, 5 and 10% levels, respectively

[A] Reference group: share of hours worked by workers born in EU15 countries

[B] Asians and Eastern Europeans regroups Eastern Europeans, North-Western Asians and Asians

[C] Others regroups Northern and Latin Americans and migrants coming from South Pacific and other origins

[D] Educational levels (2 dummies), share of workers with more than 10 years of tenure, age categories (2 dummies)

[E] Share of female workers, of part-time workers, of blue-collar workers and of fixed-term contracts

[F] Sectors of activities (9 dummies, reference), level of wage bargaining (1 dummy), number of full-time equivalent workers, location (2 dummies)