Education–Job Mismatch in Saudi Arabia: An Analysis of Horizontal Mismatch among Tertiary Graduates

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ABSTRACT

While several studies have recently examined horizontal mismatch among different individuals in the labour market, no empirical evidence from Saudi Arabia has emerged on this increasingly relevant issue in the ongoing debates about education outputs and labour market requirements. This study aimed to extend the literature by investigating the incidence and individual determinants of horizontal mismatch among Saudi tertiary graduates, using cross-sectional data based on two worker self-assessment methods. The results revealed that the observed incidence of mismatch differed within each measure depending on the level of categorisation used to classify graduates as matched or mismatched. Less than one-sixth of the graduates in the study were mismatched on each measure when using a detailed categorisation, while more than one-third were mismatched on each measure based on a dichotomous categorisation. Furthermore, the study provided evidence of the importance of several individual characteristics in explaining the probability of horizontal mismatch among graduates. Irrespective of the measure used, education level, field of study, type of contract, and work experience were all found to be major determinants of the probability of being mismatched among Saudi graduates.

Keywords: Education, Job Mismatch, Education, Occupation Mismatch, Horizontal Mismatch, Field-of-Study Mismatch, Worker Self-Assessment, Tertiary Graduates, Labour Market, Saudi Arabia

عدم التطابق بين التعليم والوظيفية في المملكة العربية السعودية: تحليل لعدم التطابق الأفقي لدى خريجي التعليم العالي

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المستخلص:

في حين أن العديد من الدراسات قد بحثت مؤخراً "عدم التوافق الأفقي" لدى مختلف الأفراد العاملين في سوق العمل، لم تظهر أي أدلة تجريبية من المملكة العربية السعودية حول هذه القضية المتزايدة الأهمية في المناقشات الجارية حول توافق مخرجات التعليم مع متطلبات سوق العمل. هدفت هذه الدراسة إلى توسيع نطاق الأدبيات الحالية من خلال استقصاء مدى انتشار عدم التطابق الأفقي——مدى توافق التخصص العلمي مع متطلبات الوظيفية——ومحدداته الفردية بين خريجي التعليم العالي السعوديين. وقد استخدمت الدراسة بيانات مسحية مستعرضة تم جمعها من 606 خريجاً سعودياً يعملون في سوق العمل، بواسطة مقياسين للتقييم الذاتي. أظهرت النتائج أن حالات عدم التطابق الأفقي لدى الخريجين اختلفت ضمن كل مقياس تبعاً لمستويات التصنيف المستخدم لعدم التطابق الأفقي. حيث وُجد، عند استخدام تصنيف تفصيلي مكون من أربع مستويات للتطابق/عدم التطابق، أن أقل من سدس الخريجين في الدراسة (16%) وفقاً لكل من المقياسين لديهم عدم تطابق أفقي——أي لا تتوافق تخصصاتهم مع مجال الوظيفة؛ بينما كان أكثر من ثلث الخريجين (33%) لا تتطابق تخصصاتهم مع متطلبات وظائفهم وفقاً لكل مقياس عند استخدام تصنيف ثنائي للتطابق/عدم التطابق. كما قدمت الدراسة أيضاً أدلة على أهمية العديد من الخصائص الفردية في تفسير احتمالية عدم التوافق الأفقي بين الخريجين. بغض النظر عن المقياس المستخدم، فقد أشارت نتائج الانحدار اللوجستي الثنائي (logit) إلى أن كل من المستوى التعليمي، والتخصص العلمي، ونوع عقد العمل، وخبرة العمل كلها محددات رئيسية لاحتمال عدم التطابق الأفقي بين الخريجين السعوديين. تناقش الورقة أهم الاستنتاجات وآثار نتائج الدراسة وقيودها، وتقدم عدداً من التوصيات للأبحاث المستقبلية.

الكلمات المفتاحية: عدم التطابق بين التعليم والوظيفية، عدم التطابق الأفقي، عدم تطابق مجال الدراسة، خريجي التعليم العالي، سوق العمل، المملكة العربية السعودية.

1. Introduction

Given the substantial private and public costs of tertiary education, it is indispensable that a proportional return on educational investment is obtained. Holding a non-matching job in terms of educational level or field of study (education–job mismatches), such that one is unable to optimally utilise their relevant qualifications and skills acquired through education, can essentially result in foregone economic and social returns on educational investments (Robst, 2007a; Somers et al., 2019). Thus, increasing concerns have been raised in many countries about the issue of education–job mismatch, leading researchers to examine its prevalence, causes, and consequences particularly among graduates in the labour market (Bender & Roche, 2013). Two types of education–job mismatch, or alternatively educational mismatch, have been theoretically and empirically distinguished: vertical (qualification) and horizontal (field-of-study) mismatches. While the former occurs when an individual's education level is higher (overeducation) or lower (undereducation) than the one required or needed by the job, the latter occurs when an individual's field of study is unrelated to, or different from, the one required or needed for their job (McGuinness, 2006; Robst, 2007a; Verhaest et al. 2017; Montt, 2017).

The literature so far has mainly focused on vertical mismatch, precisely overeducation (McGuinness et al., 2018; Sellami et al., 2018). Nevertheless, since particular fields of study prepare students for a specific range of occupations, horizontal mismatch is an equally undesirable phenomenon, in which graduates are not able to fully utilise and apply what they have learned in their field of study, and consequently, the labour market does not function efficiently (Somers et al., 2019). Furthermore, similar to vertical mismatch, horizontal mismatch has been found to potentially result in negative consequences for the mismatched individuals, their firms, and the society (e.g., Robst, 2007a; Zhu, 2014; Somers et al., 2019).

Horizontal mismatch has been observed and documented in several countries, with its incidence varying considerably across studies. In Saudi Arabia, this remains an uninvestigated area of research, although there are evident disequilibria between labour market requirements and the supply of Saudi nationals with relevant skills, which is a key focus area in the Saudi Vision 2030, the government's plan to diversify the national economy and strengthen the country's industries. Ironically, the majority of Saudis enrolling or graduating annually from local universities are in the fields of study that have been suffering from the highest unemployment rates, while those students and graduates from the fields that have the lowest unemployment in the labour market are the minority. For example, about 42% of the incoming students and 57% of the graduates from Saudi universities in 2018 were in fields such as humanities, languages and arts; and social sciences, business, and law. However, according to

the 2019 labour market statistics,[1] about 52% of the unemployed Saudis with a post-secondary diploma or higher are from these same fields. The opposite is true for fields such as engineering, manufacturing, and construction; agriculture; veterinary; health and welfare; and service industries; where incoming students and graduates in these fields were 18% and 15% of the total, respectively, in 2018. Yet, unemployment among Saudis in these fields collectively is only about 12% of the total Saudi unemployment rate (General Authority for Statistics [GAS], 2019; Ministry of Education, 2019). Hence, the supply and demand sides for national graduates continue to diverge at least in terms of the field of study.

Using cross-sectional survey data, this study then aimed to examine horizontal mismatch of tertiary graduates in Saudi Arabia, a context that has not been previously studied. Several questions guided the study. What is the extent of horizontal mismatch among Saudi graduates, and how does it compare to other countries? Do the two subjective measures result in different incidence estimates, and to what extent do they correspond with each other? What are the determinants of the horizontal mismatch with respect to socio-demographic, educational, and employment characteristics of the graduates? The paper is structured as follows. First, an overview of the international literature on measurement, prevalence, and determinants of horizontal mismatch is provided. Then, the data and methodology of the study are described. Next, the results of the analysis are presented and discussed. The paper ends with a summary of the main conclusions and implications of the study.

2. Literature review

Measurement of horizontal mismatch

The literature on educational mismatch is fairly scarce as compared to that on vertical mismatch (e.g., overeducation; Nordin et al., 2010; McGuinness, 2006; Sellami et al., 2018). Horizontal mismatch is defined as the discrepancy between the individual's attained field of study and the field of study required or needed for the job (Somers et al., 2019). Different terms have been used to describe this concept of mismatch, including horizontal mismatch, field-of-study mismatch, education–job mismatch, and field of education–occupation mismatch (e.g., Robst, 2007a, 2007b; Nordin et al., 2010; Béduwé & Giret, 2011; Støren & Arnesen, 2011; Boudarbat & Chernoff, 2012), with the first term recently becoming the most prominent. As with vertical mismatch, two main methods have been utilised in the literature to measure horizontal mismatch: job analysis

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[1] It is important to note that these labour statistics are before the outbreak of Coronavirus (COVID-19) in Saudi Arabia in early 2020.

method (JA) and worker self-assessments (WA).[1] The JA method (objective method) determines the educational requirements for a particular job title or type by assigning occupational codes to fields of study using experts' evaluation, typically framed in occupational classifications (Wolbers, 2003; Sellami et al., 2019; Somers et al., 2019). The mismatch is determined by comparing the acquired field of study with the required field (e.g., occupation codes) for the job in question (Somers et al., 2019). The WA method (subjective method) is based on a job holder's assessment of the educational requirements for their job in terms of the attended field of study. It is by far the most used method to assess this form of mismatch (McGuinness et al., 2018; Sellami et al., 2018; Somers et al., 2019).

The WA measure can be either directly or indirectly constructed. The direct method (DWA) generally asks the individual to indicate whether they are, or feel, horizontally (mis)matched (i.e., the extent to which their field of study is appropriate or required to get or perform their job, or whether or not they are working in a job that is related to their field of study). According to Sellami et al. (2018), previous studies using the DWA measure have varied widely in terms of the wording for the questions asked, the response categories offered, and the ways for classifying respondents as matched or mismatched, depending on the theoretical definition of the required field of study. The indirect method (IWA), on the other hand, asks respondents to specify the required field to get or to do their job (Sellami et al., 2018). An independent comparison of the required versus the attained field of study can then be conducted by the researcher to determine the horizontal mismatch status (Robst, 2007a, 2008; Bender & Heywood, 2011; Bender & Roche, 2013; Domadenik et al., 2013; Verhaest et al., 2017; Sellami et al., 2018; Somers et al., 2019). While IWA is widely used in the vertical mismatch literature, with the exception of Sellami et al. (2018), none of the previous studies on horizontal mismatch has yet used this measure; DWA seems to be the only WA measure used.

Prevalence of horizontal mismatch

As previously mentioned, most educational mismatch literature has focused mainly on vertical mismatch. It is only recently that researchers have focused their interest on horizontal mismatch (Boudarbat & Chernoff, 2012; Verhaest et al., 2017). Several recent review studies have documented the incidence of horizontal mismatch reported by previous studies, which varied considerably across countries, using different measurement methods (e.g., WA vs. JA) and classifications for those mismatched (e.g., severely mismatched and moderately mismatched vs. mismatched). For example, based on 52

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[1] Although realised match (RM) is a third method to measure vertical mismatch, the use of this statistical measure in the context of horizontal mismatch is uncommon in the literature. Nieto et al. (2015) and Sellami et al. (2018) are the only known examples of studies that have used it. For more detailed review and discussion of these measurement methods, their advantages, and disadvantages, refer to Sellami et al. (2018) and Somers et al. (2019).

estimates from 12 studies covering 36 countries, McGuinness et al. (2018) found the average incidence of horizontal mismatch across different measurement methods to be around 25%. The incidence ranged from 4% in Portugal to 50% in Korea. The estimates of the incidence reported in this review for the different countries are shown in Figure 1. Furthermore, Sellami et al. (2018) reviewed the field-of-study mismatch incidence in 27 studies from different countries and noted an overall incidence between 5% and 59% across all reviewed studies. The incidence estimates based on the WA measure ranged from 5% to 35%, with an average of 21%.[1] Noticeably higher incidences were found for JA, ranging from 17% to 59% with an average of 35%.

Figure   **1**

*Average incidence of horizontal mismatch in selected countries, various years*

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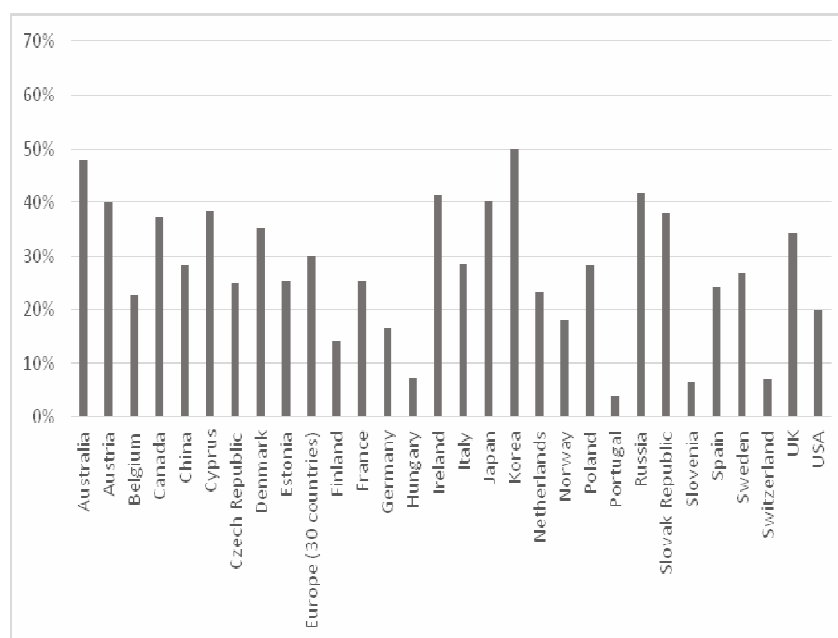
[1] According to the authors, the study of Witte and Kalleberg (1995) was a notable outlier amongst the studies using WA, with a substantially higher incidence of 46% (39% for women and 51% for men). This is perhaps due to the fact that it was the only study that measured horizontal mismatch based on "respondents' assessment of whether or not they have been trained for their current job" (Somers et al., 2019, p. 578). Therefore, the study was excluded from the data for Figure 2.

Note. The average incidence is calculated for each of the three measurement approaches. *Source.* Author's graphic based on estimates in Table 5 by McGuinness et al. (2018).

    Consistently, in their systematic review of 20 empirical studies on horizontal mismatch from 13 countries published between 1995 and 2015, Somers et al. (2019) also found substantial variation in the incidence rate of mismatch. The overall average prevalence of horizontal mismatch (i.e., individuals who were completely mismatched or held a degree that had low relevance to the job) was 23% for subjective measures (DWA) and 35% for objective measures (JA), with an estimated incidence varying from 7% in the United States (DWA; Bender & Heywood, 2011) to 63% in England (JA; Malamud, 2011).[1] Figure 2 presents the incidence of horizontal mismatch across the two measures of WA and JA in selected countries based on estimates reported by Sellami et al. (2018) and Somers et al. (2019).

Figure   2
Incidence of horizontal mismatch in selected countries, various years
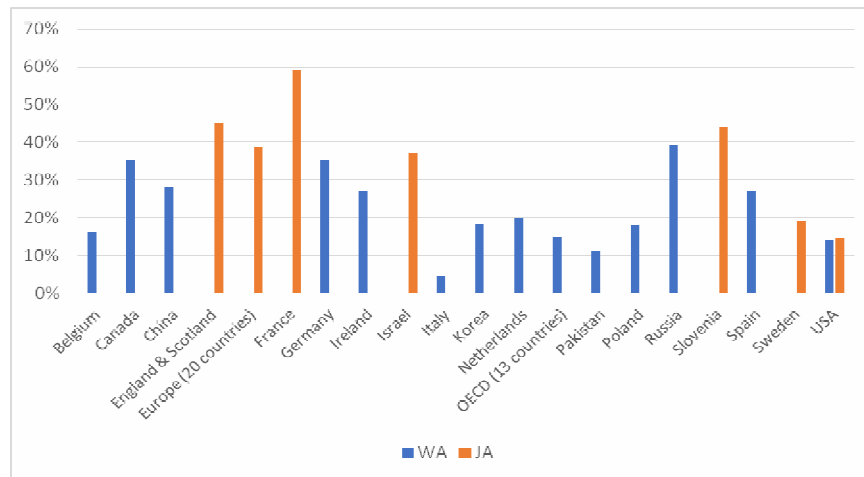
Note. WA, worker self-assessment; JA, job analysis. *Source.* Author's graphic based on estimates in Table 1 by Sellami et al. (2018) and Table 2 by Somers et al. (2019); data for Slovenia is based on 2009 estimate by Domadenik et al. (2013).

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[1] For the WA method, the incidence of "severe mismatch" ranged from 8% in the United States to 39% in Russia, while that of "moderate mismatch" ranged from 13% in Pakistan to nearly 25% in the United States.

In a cross-national analysis of educational mismatch in 23 countries using JA, Montt (2017) found that the average incidence of horizontal mismatch (without vertical mismatch) across all countries was 25%, while the average incidence of horizontal mismatch (with vertical mismatch) was 13%. The highest incidence rates of horizontal mismatch (regardless of vertical mismatch) were in Korea (50%), England and North Ireland (50%), Italy (49%) and the United States (45%), while the lowest were in Austria (18%), Finland, and Germany (both less than 30%). Using the JA method as well, Verhaest et al. (2017) examined the differences in education–job mismatches among graduates across 17 European countries in addition to Japan. They found the average rate of horizontal mismatch across all countries to be around 10%. The incidence rates here also varied widely across countries; where Norway, Portugal, and Spain have the lowest horizontal mismatch incidence of less than 5%, with several other countries (Slovenia, Germany, Belgium, Switzerland, Hungary, Italy) having an almost identical incidence at 7%. On the other hand, Estonia (16%), Poland (16%), the United Kingdom (18%), and especially Japan (35%) each had a considerably higher incidence of horizontal mismatch.

In addition to review and cross-national studies, several studies have investigated horizontal mismatch, mainly among graduates, at the country level. Examples of these countries include the United States (e.g., Robst, 2007a, 2007b; Bender & Heywood, 2011; Bender & Roche, 2013; Hur et al., 2019), Germany (Witte & Kalleberg, 1995; Boll et al., 2016), the Netherlands (Allen & Van der Velden, 2001; Hensen et al., 2011), Italy (Di Pietro & Urwin, 2006), Sweden (Nordin et al., 2010), Spain (Mora, 2010), France (Béduwé & Giret, 2011), Poland (Kucel & Vilalta-Bufí, 2012), Canada (Boudarbat & Chernoff, 2012), and Australia (Li et al., 2018). Most of these studies are included in the review studies mentioned above.

Although available evidence from the international literature generally shows that horizontal mismatch is a prominent aspect of many labour markets, with a few exceptions,[1] studies of horizontal mismatch in non-Western contexts are rare. Moreover, the author is unaware of any study that has examined this form of mismatch in Saudi Arabia or any other Middle Eastern country. One of this study's purposes, therefore, is to investigate the prevalence of horizontal mismatch among Saudi graduates and show how its incidence in Saudi Arabia compares to other countries.

Overall, and as shown by the previous findings, the incidence of horizontal mismatch differs across, and sometimes within, countries

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[1] These include Japan (e.g., Allen & Van-der-Velden, 2001; Verhaest et al., 2017), Korea (Kim et al., 2016; Park, 2018), China (Zhu, 2014), Israel (Katz-Gerro & Yaish, 2003), Sri Lanka (Senarath & Patabendige, 2014), Taiwan (Tao & Hung, 2014), and Pakistan (Farooq, 2011).

and measurement methods (Verhaest et al. 2017; Sellami 2018; Somers et al., 2019). Sizeable differences also occur within each of the measurement methods based on how the measure used is operationalised. However, generally speaking, by comparing estimates for different groups of countries across studies (see Figure 2), the average incidence of horizontal mismatch, under WA, seems to be at least slightly higher in developing countries as compared to the developed ones (roughly 26% vs. 21%), indicating that it might be more pervasive. Furthermore, taking the results of previous reviews broadly, the JA method typically tends to yield a reasonably higher average estimate of mismatch than the WA approach (about 35% vs. 22%; Sellami 2018; Somers et al., 2019).

Determinants of horizontal mismatch

Some studies have investigated the possible determinants of horizontal mismatch, though again there are fewer than those on vertical mismatch. These determinants are often examined with regard to socio-demographic, educational, and employment characteristics. Regarding socio-demographic determinants, previous studies have mainly examined the effect of sex and age on the likelihood of being mismatched. Due perhaps to family constraints and less favourable career prospects, some researchers assume that women are more likely than men to accept jobs outside their own field (Wolbers, 2003; Robst, 2007b; Hensen et al., 2009; Bender & Heywood, 2011; Farooq, 2011). Worker's age has also been suggested to be related to the probability of horizontal mismatch, either positively (Witte & Kalleberg, 1995; Wolbers, 2003; Bender & Heywood, 2011; Bender & Roche, 2013) or negatively (Hensen et al., 2009; Robert, 2014). Nevertheless, the actual empirical results for both variables appear for the most part to be insignificant or mixed (e.g., Krahn & Bowlby, 1999; Garcia-Espejo & Ibanez, 2006; Boudarbat & Chernoff, 2012; Somers et al., 2019). The insignificance of the results, which are mainly from Western countries, may warrant further research to find out how these characteristics relate to horizontal mismatch in different countries (Somers et al., 2019).

Concerning educational background, studies have pointed to the importance of the individual's educational level as well as field of study in determining the probability of horizontal mismatch. Empirical evidence suggests that level of education is negatively related to the probability of being employed in an incompatible job. Specifically, the higher the education level, the less likely the horizontal mismatch (Krahn & Bowlby, 1999; Wolbers, 2003; Robst, 2007a; Hensen, et al., 2009; Boudarbat & Chernoff, 2012; Bender & Roche, 2013). Authors argue that individuals who cannot find a job that is commensurate with their education level are likely to alternatively compete with less-educated peers and take a job beneath their level, but within their own or a related field. Because this is less applicable for the less-educated, who accordingly have restricted opportunities to secure a compatible job, they may be forced to accept a job unrelated to their field of study

when a matching job is unavailable (Borghans & De Grip, 2000; Wolbers, 2003; Somers et al., 2019).

Besides the level of education, previous research has also observed a varying risk of mismatch among individuals with different fields of study. Evidence indicates that graduates of fields such as humanities, arts, and social sciences are the most likely to be mismatched, while graduates of education, engineering, manufacturing, construction, health-related fields are the least likely to be mismatched (Wolbers, 2003; Robst, 2007a, Boudarbat & Chernoff, 2012; Sellami et al., 2018; Somers et al., 2019). It is argued that this is because the latter fields explicitly prepare students for specific careers or occupations, while the former general fields are often much less explicit about job market preparation (Wolbers, 2003; Garcia-Espejo & Ibanez, 2006; Boudarbat & Chernoff, 2012). Some researchers have also considered the potential effect of several other educational aspects on the probability of mismatch. These include type of educational programme (e.g., vocational vs. academic), mode of study (e.g., full-time vs. part-time), academic performance, time devoted to studies, and prestige of study programme (Wolbers, 2003; Garcia-Espejo & Ibanez, 200; Farooq, 2011; Boudarbat & Chernoff, 2012). However, more empirical research is required before any definitive conclusion can be made.

Findings from the literature also suggest that employment characteristics affect the likelihood of being horizontally mismatched. For example, Wolbers (2003) argues that a high unemployment rate in some fields would force graduates to adjust their career goals and both search for and accept jobs outside their primary field, perhaps to avoid or exit unemployment. It can also be expected that those workers who have been out of work in the past would be more likely than peers who have not experienced unemployment to accept a non-matching job in order to escape unemployment. Yet, it seems that no empirical study has directly examined the effect of unemployment history (e.g., incidence or length of previous unemployment) on horizontal mismatch. Furthermore, a few scholars (e.g., Wolbers, 2003; Lee & Sabharwal, 2016; Somers et al., 2019) suggest that the probability of horizontal mismatch varies between the private and the public sector, with those in the public sector being less likely to experience the mismatch. According to Wolbers (2003), because graduates from education, health, and welfare fields are often assumed to be less horizontally mismatched, and since the public sector—assumingly in the 13 European countries covered by Wolber's data— usually consists of all major educational and healthcare organisations, it is expected that the risk of being mismatched is relatively lower in the public sector relative to the private sector. Alternatively, it could simply be that these organisations in the public sector have a more defined career structure and, therefore, employ graduates mainly, if not strictly, in their respective fields. Again, further research is needed before drawing definitive conclusions.

Type of contract is also found to affect the prevalence of field-of-study mismatch. That is, holding a temporary job is linked to an increased risk of mismatch (Witte & Kalleberg, 1995; Krahn & Bowlby, 1999; Wolbers, 2003; Somers et al., 2019). It is suggested that opportunities to obtain relevant work skills and experience (e.g., through on-the-job training) are generally limited for workers in transitory jobs, as opposed to those in permanent jobs, due to the temporary nature of these jobs (Somers et al., 2019). Therefore, workers with temporary contracts are more likely to be horizontally mismatched than those with permanent contracts as a result of their lack of work competence acquired on the job (Wolbers, 2003; Somers et al., 2019). Nevertheless, the available evidence is extremely limited, and a few studies have reported contradictory results in which having a permanent contract was found to positively affect the likelihood of horizontal mismatch (Garcia- Espejo & Ibanez, 2006; Robert, 2014) or be statistically insignificant (Boudarbat & Chernoff, 2012).

Work experience, or job tenure, is also reported to determine the likelihood of being horizontally mismatched. The longer an individual works in the same job, the lower the probability of mismatch is (Witte & Kalleberg, 1995; Wolbers, 2003; Somers et al., 2019). This can be attributed to the possibility that any initial deficiencies in one's formal education (e.g., having unrelated field of study) are likely to be compensated for by the job-relevant skills and experience (Wolbers, 2003). In addition, several other employment and firm characteristics are suggested to relate to the probability of being horizontally mismatched, including job status (full-time vs. part-time; Wolbers, 2003), occupational group (professional occupations vs. non-professional occupations; Witte & Kalleberg, 1995; Farooq, 2011; Somers et al., 2019), occupational sector (self-employed workers vs. salaried workers; Bender & Roche, 2013), and firm size (small vs. large; Witte & Kalleberg, 1995; Wolbers, 2003). However, empirical studies on the significance and effect of these characteristics are limited.

In general, the findings of previous studies show that the probability of horizontal mismatch depends on several demographic, educational, and employment characteristics. While some of these characteristics are consistently found to be significantly relevant in determining mismatch status, the empirical evidence on the relevance of others is mixed or unclear. Finally, it is important to note that the identified determinants are based on different measures, countries, and time periods, which all have the potential to influence how these factors interact with horizontal mismatch (Somers et al., 2019).

3. Methods

The study was carried out over a three-week period in August 2019 on the graduates of two public universities in Saudi Arabia. The conduct of the study was approved by the proper authorities, and all participants provided informed consent to participate in the study.

Sample

This study focused only on Saudi graduates who completed at least a post-secondary diploma (levels 4 or 5 of the International Standard Classification of Education, ISCED 4 or 5), and who held full-time paid employment at the time of completing the survey. Table 1 represents the characteristics of the study sample. The participants (N = 606) were mostly men (72.3%), from the Makkah province (58.1%), and younger than 40 years old (72.8%). The majority of the participants had an undergraduate degree (59.7%), specialised/studied in social sciences or sciences (58.6%), held a permanent job (61.9%), and had less than 10 years of working experience (73.7%).

Table   **1**
Characteristics of the study sample

Characteristic	n	%
Sex		
Woman	168	27.7
Man	438	72.3
Age (years)		
20–29	204	33.7
30–39	237	39.1
40–49	109	18.0
≥ 50	56	9.2
Administrative region		
Riyadh	132	21.8
Makkah	352	58.1
Eastern Region	52	8.6
Other[a]	70	11.6
Level of Education		
Post-secondary diploma	59	9.7
Bachelor's degree	303	50.0
Higher diploma or master's degree[b]	128	21.1
Doctorate or equivalent	116	19.1
Field of study		
Social sciences, business, & law	230	38.0
Humanities, languages, & arts	89	14.7
Teacher training & education science	47	7.8

Science, mathematics, & computing	125	20.6
Engineering, manufacturing, & construction	69	11.4
Health & welfare	46	7.6
Unemployment history (times of previous unemployment)		
0 time	312	51.5
1 time	162	26.7
2 times	71	11.7
≥ 3 times	61	10.1
Sector		
Public	287	47.4
Private	300	49.5
Other[c]	19	3.1
Type contract		
Temporary	231	38.1
Permanent	375	61.9
Work experience (years)		
< 5	331	51.3
5–9	136	22.4
10–14	74	12.2
15–19	40	6.6
≥ 20	45	7.4

Note. $N = 606$.

[a]Other regions include Madinah, Qassim, Asir, Tabuk, Northern Borders, Hail, Jazan, Najran, Al Baha, and Al Jouf. [b]Seventeen of the participants (2.8%) held a higher diploma, while 110 (18.2%) had a master's degree. [c]Other sectors include the non-profit organisations sector and the sector of regional and international organisations.

Data collection

An online survey was constructed by the author and administered to the Saudi graduates of the two oldest and largest public universities in Saudi Arabia, which have the largest number graduates in the country.[1] Using an alumni database at each university, which contains contact information of those who had attended the university in the past (but had not necessarily completed a degree), 3000 past students were randomly selected from both universities and emailed an invitation, requesting the participation of only Saudi graduates holding a paid job in Saudi Arabia. Participants were required to confirm their eligibility to participate prior to accessing and completing the survey. Based on their preference, potential graduates could choose to complete the survey either in Arabic or English. Of the total Saudi graduates sampled for the study, 767 responded to the survey, a response rate of 25.6%. Excluding those with incomplete (i.e., those who did not provide valid information on all variables of interest) or unusable responses (i.e., those with a degree lower than a post-secondary diploma and those who were self-employed) reduced the final sample to 606 graduates.

Measurement of Variables

Horizontal mismatch was measured using two WA measures, whereby the participants were asked, either directly or indirectly, about the status of their field-of-study (mis)match. The first item was a DWA that asked individuals to indicate the appropriate field of study necessary to adequately do the job from their own perspective. It was derived from the following question: "*In your own experience, which field of study do you feel is most appropriate to perform your current job?*" Four answers were offered: (1) "only my own field", (2) "my own or a related field", (3) "a completely different field", (4) "for this job, no particular field is needed".[2] For the empirical analysis, two different ways (levels of categorisation) were used to classify graduates as matched or mismatched; (A) a detailed categorisation (four-category categorisation) and (B) a broad or aggregated categorisation (dichotomous categorisation). For Categorisation A, participants were first classified into the following corresponding categories: completely matched (selecting 1), somewhat matched (selecting 2), mismatched (selecting 3), no particular field was needed (selecting 4). Additionally, following previous studies (Allen & van der Velden, 2001; Sellami et al., 2018), for Categorisation B, participants whose chose one of the first two answers were further

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[1] For confidentiality reasons, and as requested by the permission-granting authority at each university, the two participating universities are not named.

[2] This DWA measure is similar to those used by previous studies, with differently formulated questions (e.g., Allen & van der Velden, 2001; Kucel & Vilalta-Bufí, 2010; Kucel et al., 2011; Støren & Arnesen, 2011; Verhaest et al., 2017).

classified as matched in the current analysis, while those in the latter two categories were defined as mismatched.[1]

The second measure, IWA, asked participants to specify the detailed field of study required for new applicants to meet the hiring criteria for their current job. It was based on the following question: "*What specific field of study is formally required to get your current job?*" If necessary, participants were able to indicate more than one specific field of study required by the job. Overall, 425 participants reported only one required field, 45 reported two or three different but related fields (36 reported two fields and 9 reported 3 fields), 133 reported no particular field was required, and 3 participants indicated that they did not know what field was required by the job. A comparison of the required field(s) of study with the individual's attained field was then made by the author, whereby participants were classified relying on the same aforementioned two levels of aggregation or categorisation as done for DWA. For Categorisation A, participants were classified into one of four categories: (1) completely matched (when the attained field closely corresponded to at least one of the required fields), (2) somewhat matched (when the attained field was somewhat related to at least one of the required fields), (3) mismatched (when the required and attained fields were completely different), or (4) for this job, no particular field of study is required (when no field was required for the job or when no field was reported by the participants). Here too, for Categorisation B, the first two categories were defined as horizontally matched and the latter two were defined as mismatched. Again, with the exception of Sellami et al. (2018), no other study as far as we know has used a similar IWA measure.

For further analysis and to compare the current results with other studies, both the initial detailed categorisation (A) and the later dichotomous categorisation (B) will be reported in the empirical analysis of the two measures. It is also important to note, especially when interpreting the current results, that DWA focuses on the individuals' views of the appropriate educational requirements for the job (i.e., field of study *appropriate to do* the job), whereas IWA emphases the formal requirements by the job (i.e., field of study *required to get* the job).

The data set also included several socio-demographic, educational, and employment-specific explanatory variables that have been frequently considered by previous studies as potential determinants of educational mismatch (e.g., Wolbers, 2003; Robst, 2007a; Verhaest & Omey, 2010; Boudarbat & Chernoff, 2012; Sellami et al., 2018). These variables included sex, age, level of education,

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[1] Several arguments are put forward by previous researchers in favour of considering individuals as horizontally mismatched if they reported that "no particular field of study was need or required" (see Allen & van der Velden, 2001; Sellami et al., 2018).

field of study, unemployment history (times of previous unemployment), sector, type of job contract, and work experience.[1]

Data analysis

Descriptive statistics (frequencies) were used to assess the prevalence of horizontal mismatch based on each of the DWA and IWA measures, while cross-tabulation and correlation (Spearman's rank-order correlation) were used to assess the correspondence between the two measures. Moreover, for each measure, binary logistic regression (logit) was performed in order to determine the probability of occurrence of horizontal mismatch (dichotomous dependent variable) from a set of socio-demographic, educational, and employment characteristics (explanatory independent variables). For each model, the continuous independent variable (age) was found to be linearly related to the logit of the dependent variable (DWA, IWA), resulting in acceptable statistical significance when $p < .05$. There were twelve cases with standardised residual values greater than ± 2.5 standard deviations (seven and five for DWA and IWA models, respectively) which were kept in the analysis.

4. Results and discussion

Prevalence of horizontal mismatch

The incidence of horizontal mismatch based on Categorisation A for the two measures is shown in Table 2. For DWA, about 20% of the participants reported being completely matched, 44% reported being somewhat matched, 13% reported being mismatched, and 23% reported no particular field of study was needed to perform their job. For IWA, 46% of the participants were completely matched, 19% were somewhat matched, 16% were mismatched, and 19% were found to be in a job for which no particular field was required. While the distribution of the participants in the "completely matched" and "somewhat matched" categories varied largely across the DWA and IWA measures, the proportions of those in the "mismatched" and "no field was needed or required" categories were fairly similar for the two measures. More importantly perhaps is that only 16% or less of Saudi graduates in the study reported being horizontally mismatched based on both measures. For DWA, this incidence of measured mismatch is within the incidence range of 5–35% or 8–39% reported in the literature for WA measures, but lower than the average incidence of 21% or 23% (Sellami et al., 2018; Somers et al., 2019, respectively). It is also more or less comparable to the incidence reported by previous studies, using DWA measures and similar categorisations, in several Western countries (e.g., 8-20% in the United States; Robst, 2007a, 2007b; Bender & Heywood, 2011; Bender & Roche 2013; 16% in

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[1] Socio-demographic variables also included administrative region, which was not included as a potential determinant of horizontal mismatch, but rather as a descriptive variable of the study sample (see Table 1).

Flanders; Sellami et al., 2018) and non-Western countries (e.g., 11% in Pakistan; Farooq, 2011; 12% in Sri Lanka; Senarath & Patabendige, 2014).

Table **2**
Incidence of horizontal mismatch

Horizontal mismatch	Completely matched		Somewhat matched		Mismatched		No field required/ needed	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
DWA	119	19.6	267	44.1	78	12.9	142	23.4
IWA	280	46.2	114	18.8	95	15.7	117	19.3

Note. *N* = 606. DWA, direct worker self-assessment; IWA, indirect worker self-assessment.

Additionally, the percentage of mismatched individuals based on IWA is much lower than that reported by Sellami et al. (2018) who found the proportion of Flemish individuals in this mismatch category to be 25% and 35% based on the detailed and aggregated clustering of the fields of study, respectively.[1] Furthermore, a fairly large percentage of graduates (nearly one-fifth for each measure) were in a job that required no particular field either to get or to perform, which is somewhat higher than the percentage found for this category in previous studies based on DWA (e.g., Kucel & Vilalta-Bufí, 2010; Little & Arthur, 2010; Kucel et al., 2011; Senarath & Patabendige, 2014), although it is comparable to that reported by Sellami et al. (2018) for IWA (21%) and Mora (2010) for DWA (19%). This may mean that many of the tertiary graduates in the current data (90% of whom had a bachelor's degree or higher) were in low-skilled job (e.g., sales and services) that naturally required relatively low levels of education (e.g., a secondary school degree) and no particular field of study to get or to do the job.

Table 3 presents the incidence of horizontal mismatch based on Categorisation B (matched vs. mismatched). As expected, a higher incidence of (mis)match is noted when using this more aggregate classification. The figures here converge, and the distribution of participants across the matched and mismatched categories looks very similar. Specifically, more than half of the participants were matched relying on DWA and IWA, 64% and 65% respectively. On the other hand, 36% and 35% were mismatched based on the two measures. These percentages of mismatched graduates are significantly higher than the average incidence of mismatch found in previous studies for WA (21%; Sellami et al., 2018; 23%; Somers et al., 2018), and are nearly at the maximum incidence observed for this method (35%;

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[1] As previously mentioned, this is the only known comparable study that has used a similar IWA measure.

Sellami et al., 2018; 39%; Somers et al., 2019). With a few exceptions (e.g., Germany; Klein, 2011; Russia; Shevchuk et al., 2015; Canada; Boudarbat & Chernoff, 2012), when relying on dichotomisation, DWA yielded a higher mismatch incidence than the average incidence reported for most countries under this categorisation (e.g., Robst, 2007a; Allen & van der Velden, 2001; Di Pietro & Urwin, 2006; Kelly et al., 2010; Verhaest, et al., 2011; Kucel & Vilalta-Bufí, 2012; Zhu, 2014; Kim et al., 2016; Li et al., 2018; see Figure 2).

Table   **3**

Incidence of horizontal mismatch (matched vs. mismatched)

Horizontal mismatch	Matched		Mismatched		Total	
	n	*%*	*n*	*%*	*n*	*%*
DWA	386	63.7	220	36.3	606	100
IWA	394	65	212	35	606	100

Note. N = 606. DWA, direct worker self-assessment; IWA, indirect worker self-assessment. Matched includes the "completely matched" and "somewhat matched" categories; mismatched includes the "mismatch" and "no field was required/needed" categories.

For IWA, however, the percentage of mismatch based on this classification is still significantly lower than that reported by Sellami et al. (2018) for Flanders, which is noted to be 66% when using "detailed clusters of the fields of study" and 46% based on a "broad clustering for the fields of study". Broadly speaking, therefore, the incidence of horizontal mismatch among Saudi graduates is higher than the average incidence in prior research when relying on the broad or aggregated classification, while the opposite is true when using the detailed classification.

Although the two measures somewhat diverged in term of those classified as completely matched and somewhat matched on Classification A (i.e., produced contradictory figures), they yielded nearly identical results for those (mis)matched on Classification B. In general, the incidence of horizontal mismatch across measures mainly depended on whether each of the second (somewhat matched) and fourth (no particular field of study was needed or required) categories was considered as a separate category (Categorisation A) or as a (mis)match (Categorisation B). In the case of the latter the incidence of mismatch was relatively high for both WA measures.

Correspondence between measures of horizontal mismatch

Table 4 reports the correspondence between the two WA measures based on Categorisation A. Based on this detailed operationalisation, about 59% of the participants were classified the same using both measures of DWA and IWA, while 41% had classifications which differed between the two measures. Looking first at the participants who fell into the same groups on both measures, 19.6% were completely matched, 16% were somewhat matched, 9.2%% were mismatched, and 14.5% were in jobs that did not need or require a particular field of study. Interestingly, when considering those who fell into different categories, none of the participants who were completely matched on DWA fell into other categories for the IWA measure. In contrast, 25.7% of the participants who were completely matched on IWA were only somewhat matched on DWA and 0.8% reported no field needed on this latter measure. Furthermore, of the participants who reported being somewhat matched on DWA, 0.2% were found to be mismatched and 2.1% in a job that required no field of study on IWA. The figures for those who reported the opposite were somewhat similar; of those who were somewhat matched for IWA, 1% reported being mismatched and 1.8% in a job that needed no field on DWA. Finally, 2.6% of the participants who were mismatched on DWA were in job that required no particular field to get (IWA), whereas 6.3% of those who were mismatched on the latter (IWA) reported being in job that needed no particular field to perform (DWA).

Table   **4**
Correspondence between the measurement methods of horizontal mismatch

| DWA | IWA | | | | | | | | | |
| | Completely matched | | Somewhat matched | | Mismatched | | No field required /needed | | Total | |
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Completely matched	119	19.6	0	0.0	0	0.0	0	0.0	119	19.6
Somewhat matched	156	25.7	97	16	1	0.2	13	2.1	267	44.1
Mismatched	0	0.0	6	1.0	56	9.2	16	2.6	78	12.9
No field required /needed	5	0.8	11	1.8	38	6.3	88	14.5	142	23.4
Total	280	46.2	114	18.8	95	15.7	117	19.3	606	100

Note. N = 606. DWA, direct worker self-assessment; IWA, indirect worker self-assessment.

The two measures of horizontal mismatch overlapped largely when relying on the dichotomous categorisation (Categorisation B) as shown in Table 5. Overall, 94% of the participants fell into the same groups on both measures, while only 6% fell into different groups. Specifically, 61% were similarly matched and 33% were equally mismatched on both measures. On the contrary, 4% were mismatched on DWA but matched on IWA, while about 2% reported the opposite. Unsurprisingly, the correlation between the two measures based on this categorisation was significantly high at 0.88, $p < .01$.

It is, thus, clear that the correspondence between the DWA and IWA measures largely depends on the levels of categorisation used. A higher correspondence is found when relying on the aggregate categorisation as compared to the detailed categorisation. This confirms the conclusion made by Sellami et al. (2018) that the choice of specific classification or levels of aggregation for each measure influence the results regarding the overall incidence of horizontal mismatch and the correspondence between the different measures.

Table   **5**
Correspondence between the measurement methods of horizontal mismatch (matched vs. mismatched)

DWA	IWA				Total	
	Matched		Mismatched			
	n	*%*	*n*	*%*	*n*	*%*
Matched	372	61.4	14	2.3	386	63.7
Mismatched	22	3.6	198	32.7	220	36.3
Total	394	65.0	212	35.0	606	100

Note. N = 606. DWA, direct worker self-assessment; IWA, indirect worker self-assessment.

Determinants of horizontal mismatch

The study assessed the probability of horizontal mismatch with respect to several individual characteristics for each of the two WA measures. For the outcome variable (horizontal mismatch), the dichotomous categorisation was used (see Table 3). Tables 6 and 7 present the results of the binary logistic estimations of the probability of mismatch for measures of both DWA and IWA. Interestingly, in each regression model, the same four variables, out of eight predictor variables, were statistically significant: level of education, field of study, type of contract, and work experience.

Regarding socio-demographics, neither sex nor age was statistically significant for explaining the probability of mismatch under the definition of both measures. Unlike some earlier studies (e.g., Wolbers, 2003; Hensen et al., 2009; Bender & Heywood, 2011;

Boudarbat & Chernoff, 2012; Bender & Roche, 2013; Robert, 2014), but consistent with some others (e.g., Garcia-Espejo & Ibanez, 2006; Boudarbat & Chernoff, 2012; Sellami et al., 2018), this study found no significant evidence regarding the effect of these characteristics on horizontal mismatch among Saudi graduates. This further confirms that these personal variables might not be important for determining mismatch status irrespective of the country context.

Educational characteristics, on the other hand, were significant in explaining mismatch probability for both measures. In terms of education level, participants with a "doctorate or equivalent" were exposed to a lower probability of being mismatched, as defined by DWA, than those with a "post-secondary diploma", which served as a baseline. These participants were also at a lower risk of horizontal mismatch than the baseline risk for being mismatched on the IWA measure. Additionally, holding a "higher diploma or master's degree" was also associated with a significantly lower risk of mismatch under this latter measure as compared to having a post-secondary diploma (the reference category). It seems that having a higher educational level, a postgraduate degree in particular, results in lower risk of being mismatched. This result is in line with previous findings suggesting that the higher their level of education, the lower a person's likelihood of being mismatched is. Better-educated individuals (vs. less-educated peers) are more likely to be working in a field related to their studies (Krahn & Bowlby, 1999; Wolbers, 2003; Robst, 2007a; Boudarbat & Chernoff, 2012; Bender & Roche, 2013). As discussed in the literature review, this finding is not surprising since these better-educated individuals have more opportunities, as compared to their less-educated counterparts, to secure a job in their own fields when a matching job (a job that matches their level of education) is not available (Borghans & De Grip, 2000; Wolbers, 2003; Somers et al., 2019). In addition to this reasoning, higher degrees are usually more field-specific and in many cases research-oriented, and for this reason, graduates are hired mainly to work in their respective fields. On the contrary, graduates with a diploma, or even a bachelor's degree, which is often a more general type of degree, are more likely to be forced to take jobs outside their fields of study.

Moreover, the results revealed a lower likelihood of being mismatched, on both measures of DWA and IWA, for participants in the fields of "science, mathematics, and computing" and "engineering, manufacturing, and construction" in comparison to those in "social sciences, business, and law", which served as a baseline. For both measures, the probability of horizontal mismatch among participants in the fields of "humanities, languages, and arts", "teacher training and education science", and those in "health and welfare" was not significantly different from that of those in the baseline field. These results are, at least partially, consistent with those of previous studies (Wolbers, 2003; Robst, 2007a; Robert, 2014; Verhaest et al., 2015; Sellami et al., 2018), which found graduates in "social and behavioural sciences" and those in "humanities, arts, and languages" to have a higher likelihood of mismatch.

Table   **6**
Logistic regression analysis of the probability of horizontal mismatch (DWA)

Independent variable	B Coefficient	SE	Wald's χ^2	Odds ratio	95% CI for odds ratio	
					Lower	Upper
Socio-demographic characteristics						
Sex (ref. = man)	-0.419	0.247	2.875	0.658	0.405	1.068
Age (years)	0.009	0.019	0.200	1.009	0.971	1.047
Educational characteristics						
Level of education (ref. = post-secondary diploma):						
Bachelor's degree	0.593	0.318	3.480	1.810	0.970	3.375
Higher diploma or master's degree	-0.410	0.382	1.152	0.664	0.314	1.403
Doctorate or equivalent	-2.248**	0.725	9.627	0.106	0.026	0.437
Field of study (ref. = social sciences, business, & law):						
Humanities, languages, & arts	0.556	0.315	3.115	1.743	0.940	3.232
Teacher training & education science	0.133	0.465	0.082	1.142	0.459	2.843
Science, mathematics, & computing	-0.692*	0.281	6.055	0.501	0.288	0.869
Engineering, manufacturing, & construction	-0.675*	0.328	4.238	0.509	0.268	0.968
Health & welfare	-1.144	0.616	3.445	0.319	0.095	1.066
Employment characteristics						
Unemployment history (ref. = not previously unemployed)	0.350	0.225	2.435	1.420	0.914	2.204
Sector (ref. = public):						
Private	-0.778	0.570	1.863	0.459	0.150	1.404
Other	-0.465	0.533	0.762	0.628	0.221	1.784
Type of contract (ref. = permanent)	0.709**	0.242	8.579	2.032	1.264	3.265
Work experience (ref. = < 5 years)						
5–9	0.075	0.275	0.075	1.078	0.629	1.849

Independent variable	B Coefficient	SE	Wald's χ^2	Odds ratio	95% CI for odds ratio	
					Lower	Upper
10–14	0.135	0.388	0.121	1.144	0.535	2.448
15–19	-1.240*	0.616	4.058	0.289	0.087	0.967
≥ 20	-2.489*	1.130	4.852	0.083	0.009	0.760
Constant	-0.438	0.884	0.246	0.645		
Model χ^2	191.103***					
df	18					
Nagelkerke R^2	.370					
Classification						
Overall	73.9%					
Matched	81.9%					
Mismatched	60%					

Note. $N = 606$. The dependent variable, DWA, direct worker self-assessment, was coded as 0 = matched, 1 = mismatched; sex was coded as 0 = man, 1 = woman; unemployment history was coded as 0 = not previously unemployed, 1 = previously unemployed; type of contract was coded as 0 = permanent, 1 = temporary.

*$p < .05$, **$p < .01$, ***$p < .001$.

Table 7

Logistic regression analysis of the probability of horizontal mismatch (IWA)

Independent variable	B Coefficient	SE	Wald's χ^2	Odds ratio	95% CI for odds ratio	
					Lower	Upper
Socio-demographic characteristics						
Sex (ref. = man)	-0.354	0.246	2.070	0.702	0.433	1.137
Age (years)	0.007	0.019	0.121	1.007	0.969	1.045
Educational characteristics						
Level of education (ref. = post-secondary diploma):						
Bachelor's degree	0.301	0.315	0.909	1.351	0.728	2.505
Higher diploma or master's degree	-0.867*	0.387	5.022	0.420	0.197	0.897
Doctorate or equivalent	-2.552***	0.728	12.300	0.078	0.019	0.324
Field of study (ref. = social sciences, business, & law):						

Independent variable	B Coefficient	SE	Wald's χ^2	Odds ratio	95% CI for odds ratio	
					Lower	Upper
Humanities, languages, & arts	0.593	0.316	3.510	1.809	0.973	3.364
Teacher training & education science	0.231	0.468	0.244	1.260	0.503	3.155
Science, mathematics, & computing	-0.662*	0.280	5.575	.516	0.298	0.894
Engineering, manufacturing, & construction	-1.054**	0.344	9.386	0.349	0.178	0.684
Health & welfare	-1.113	0.619	3.234	0.329	0.098	1.105
Employment characteristics						
Unemployment history (ref. = not previously unemployed)	0.449	0.227	3.935	1.568	1.005	2.444
Sector (ref. = public):						
Private	-0.555	0.572	0.944	0.574	0.187	1.760
Other	-0.409	0.531	0.593	0.664	0.234	1.882
Type of contract (ref. = permanent)	0.498*	0.244	4.149	1.645	1.019	2.655
Work experience (ref. = < 5 years)						
5–9	-0.011	0.275	0.001	0.990	0.578	1.695
10–14	-0.043	0.392	0.012	0.958	0.444	2.066
15–19	-2.013**	0.719	7.848	0.134	0.033	0.546
≥ 20	-2.622*	1.135	5.339	0.073	0.008	0.672
Constant	-0.164	0.883	0.035	0.848		
Model χ^2	189.843***					
df	18					
Nagelkerke R^2	0.370					
Classification						
Overall	74.9%					
Matched	82.5%					
Mismatched	60.8%					

Note. $N = 606$. The dependent variable, IWA, indirect worker self-assessment, was coded as 0 = matched, 1 = mismatched; sex was coded as 0 = man, 1 = woman;

unemployment history was coded as 0 = not previously unemployed, 1 = previously unemployed; type of contract was coded as 0 = permanent, 1 = temporary.

$^*p < .05, ^{**}p < .01, ^{***}p < .001.$

The only unexpected result was that for graduates in the field of "health and welfare" who were expected—based on the findings of prior research (e.g., Wolbers, 2003; Boudarbat & Chernoff, 2012; Sellami et al., 2018), the rather specialised nature of the field, and the low unemployment rate for this field—to be at a significantly lower, if not the lowest, risk of mismatch compared to those in the reference category.[1]

Overall, then, with the exception of "health and welfare", graduates of scientific and technical fields were less likely to be mismatched relative to those of traditional fields of social sciences. An evident explanation suggested by previous researchers is that study programmes in scientific and technical fields tend to be occupation-specific and prepare students with skills for specific jobs only; therefore, graduates of these programs are usually less likely to look for jobs outside their field. Conversely, study programs in social and behavioural sciences are often general in nature and provide students with a rather broad set of skills that can be applied to many jobs including those outside the domain (Wolbers, 2003; Boudarbat & Chernoff, 2012; Sellami et al., 2018; Somers et al., 2019). The differing mismatch probability might also be explained by the varying supply and demand (low vs. high) for graduates in these different fields (occupationally focused fields vs. non-occupationally focused fields) in the Saudi labour market.

Unexpectedly, the effects of the employment characteristics such as unemployment history and sector were statistically non-significant for both measures. This is inconsistent with the idea that having been out of work in the past or being in a particular sector (i.e., public or private) would increase the likelihood of field-of-study mismatch (Wolbers, 2003; Lee & Sabharwal, 2016). However, in the case of both measures, the results indicated that working in a temporary contract job (vs. a permanent job) significantly increased the risk of mismatch. This finding of an increased odds of mismatch among temporary or fixed contract workers is, in fact, compatible with our expectations and the previous evidence (e.g., Witte & Kalleberg, 1995; Krahn & Bowlby, 1999; Wolbers, 2003), although some researchers found either the opposite, in which having a temporary contract job increased the match (Garcia-Espejo & Ibanez, 2006; Robert, 2014) or had non-significant results (Boudarbat & Chernoff, 2012). As previously discussed, graduates with a temporary contract might be more exposed to horizontal mismatch (vs. those with a permanent contract) on the basis that they essentially lack work skills and experience often acquired in permanent jobs (Wolbers, 2003;

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[1] The unemployment rate among Saudis with a post-secondary diploma or higher in health and welfare is 5%, which is significantly lower than that of other fields (e.g., 28% for humanities; 14% for business and management; GAS, 2019).

Somers et al., 2019). Also, it is presumably possible that because of the short duration of the temporary contract jobs, educational requirements either to get or to perform the job, and hence horizontal mismatch, might be of less concern to graduates and potential employers alike, leading graduates in these jobs to be more prone to mismatch.

Lastly, significant results were observed for both measures when analysing the effect of work experience. With "less than 5 years" set as a baseline, the probability of having a field-of-study mismatch, as measured by both DAW and IWA, was significantly lower for those participants with "15–19 years" of experience and those with "20 years or more". Although those who had work experience of "10–15 years" were at lower risk of mismatch than the baseline, it was statistically non-significant. This result, in other words, means that the more work experience one has, the lower the risk of mismatch to get or to do the job becomes. It is in line with prior studies that found a negative relationship between job tenure and the likelihood of horizontal mismatch (e.g., Witte & Kalleberg, 1995; Wolbers, 2003; Somers et al., 2019). A potential explanation is that the longer time one spends in the same job, the higher the chance that initial horizontal mismatch (either to get or to do the job), if present, is compensated for by work experience and on-the-job training, which both contribute to the employee being more likely to accumulate the specific field skills required for the job (Wolbers, 2003). It is also possible that those who find a job that fits their field of study are more likely stay in the same job for longer as compared to their mismatched counterparts who might be more motivated to search for and shift to a more matching job.

Overall, the two WA measures interestingly delivered identical results regarding the determinants of horizontal mismatch. Indeed, when looking at the group differences in the probability of being mismatched, the only noted difference across the two measures was in the case of education level, in which participants with a "higher diploma or master's degree" showed a significantly lower risk of mismatch (vs. the omitted level of post-secondary diploma) on IWA but not on DWA.

5. Conclusions and research implications

The literature on educational mismatch is quite substantial, however, limited empirical studies have investigated horizontal mismatch as compared to vertical mismatch. Using two WA measures (DWA and IWA), the current cross-sectional study attempted to add value by examining the prevalence and potential determinants of horizontal mismatch among the population of Saudi tertiary graduates. It is the first known study to tackle this issue in such a context. The results suggest several important conclusions. The observed incidence of mismatch on each measure as well as their correspondence differed across the two levels of categorisation used: a four-category

classification (A) and a dichotomous classification (B). The first classification generally resulted in a lower incidence of mismatch than the average incidence reported by previous research for WA measure, whereas the second yielded a higher incidence than most previous studies. Relying on the first categorisation, less than one-sixth of graduates (13% and 16%, respectively) were completely mismatched based on DWA and IWA. On the other hand, the dichotomous operationalisation produced a relatively higher incidence of mismatch, whereby more than one-third of the graduates were mismatched on each measure (36% and 35% for DWA and IWA, respectively).

Not surprisingly, a higher convergence between the two measures was observed under the dichotomous categorisation as relative to the detailed one. That is, 59% of the graduates were equally classified on both measures based on the detailed categorisation (only 9% of whom were consistently mismatched), while 94% were equally classified on both measures when relying on the aggregate one (33% of whom were equally mismatched). Furthermore, the study provided evidence of the importance of several individual characteristics as potential determinants of horizontal mismatch among Saudi graduates. Irrespective of the measure used, graduates with lower educational levels (vs. those with higher educational levels), from the traditional fields of social and behavioural sciences (vs. those from scientific and technical fields), holding a temporary contract (vs. those holding a permanent contract), or with less work experience (vs. those with more work experience) were at a higher probability of being mismatched.

The study's conclusions should be considered in concert with its limitations. The results are limited by the sample size, which is fairly small to draw definite conclusions about the incidence and determinates of horizontal mismatch among the target population. Despite the study's importance and valuable insights, this might restrict the generalisation of the findings to all Saudi graduates. The self-report measure might also impose limitations. Even though social desirability might be less prominent with regard to horizontal mismatch as compared to vertical mismatch, the used WA measures are still vulnerable to measurement error, where participants may understand, interpret, or perceive the questions asked in the survey in different ways, depending on their attitudes or feelings towards the job (see Sellami et al., 2018). Apart from the inherent limitations of WA, the specific ways in which graduates were classified as matched or mismatched (i.e., categorisation within both measures) might have also affected the conclusions regarding the overall incidence of mismatch and the characteristics that were found to determine its probability. Although the classification decisions made in the current empirical analysis are thought to be appropriate based on careful consideration of previous studies, such choices made by researchers are often based not only on substantive considerations but also on practical ones, not to mention that they can be arbitrary sometimes (e.g., Sellami et al., 2018). For example, concerning dichotomous categorisation, some researchers might assign those in the "somewhat match" category as mismatched and those in the "no particular field was required" as

matched. In the case of IWA, different decisions might have also been made by other researchers for the classification of participants, which is entirely based on the researcher's assessment.

It can be concluded, then, that similar to many other countries, horizontal mismatch exists among tertiary graduates in Saudi Arabia, with some of them being at higher risk of mismatch than others. The extent of the incidence, however, depends largely on the chosen categorisation of the WA measures and how the results are interpreted. Broadly speaking and in light of the current results, a better education–job match among Saudi graduates should be targeted and promoted in order to ensure adequate public and private returns to education. This may require overarching policy and practice interventions at organisational and national levels to address the discrepancies between supply and demand for tertiary graduates within certain fields of study, which are arguably one of the main reasons for both education mismatch and unemployment in the Saudi labour market. Besides, further research building on the current study is required to obtain a better understanding of the incidence and correlates of horizontal mismatch in Saudi Arabia as well as implement effective policy responses. Studies may attempt to verify the current results either by using a larger sample of Saudi graduates or by targeting specific working populations in the labour market. The use of different measurement methods (e.g., objective measures) might be another area to tackle in future studies.

References

Allen, J., & Van der Velden, R. (2001). Educational mismatches versus skill mismatches: Effects on wages, job satisfaction, and on-the-job search. *Oxford Economic Papers*, *3*, 434–452. https://doi.org/10.1093/oep/53.3.434

Béduwé, C., & Giret, J. F. (2011). Mismatch of vocational graduates: What penalty on French labour market? *Journal of Vocational Behavior*, *78*(1), 68–79. https://doi.org/10.1016/j.jvb.2010.09.003

Bender, K. A., & Heywood, J. S. (2011). Educational mismatch and the careers of scientists. *Education Economics*, *19*(3), 253–274. https://doi.org/10.1080/09645292.2011.577555

Bender, K. A., & Roche, K. (2013). Educational mismatch and self-employment. *Economics of Education Review*, *34*, 85–95. https://doi.org/10.1016/j.econedurev.2013.01.010

Boll, C., Leppin, J. S., & Schömann, K. (2016). Who is overeducated and why? Probit and dynamic mixed multinomial logit analyses of vertical mismatch in East and West Germany. *Education Economics*, *24*(6), 639–662. https://doi.org/10.1080/09645292.2016.1158787

Borghans, L., & de Grip, A. (Eds). (2000). *The overeducated worker? The economics of skill utilization*. Cheltenham, UK: Edward Elgar.

Boudarbat, B., & Chernoff, V. (2012). Education-job match among recent Canadian university graduates. *Applied Economics Letters*, *19*(18), 1923–1926. https://doi.org/10.1080/13504851.2012.676730

Di Pietro, G., & Urwin, P. (2006). Education and skills mismatch in the Italian graduate labour market. *Applied Economics*, *38*(1), 79–93. https://doi.org/10.1080/00036840500215303

Domadenik, P., Farčnik, D., & Pastore, F. (2013). *Horizontal mismatch in the labour market of graduates: The role of signalling*. (IZA Discussion Paper No. 7527). Institute for the Study of Labor (IZA), Bonn, Germany. http://ftp.iza.org/dp7527.pdf

Farooq, S. (2011). Mismatch between education and occupation: A case study of Pakistani graduates. *Pakistan Development Review*, *50*(4), 531–553. https://doi.org/10.1021/jm00329a024

Garcia-Espejo, I., & Ibanez, M. (2006). Education-skill matches and labour achievements among graduates in Spain. *European Sociological Review*, *22*(2), 141–55. https://doi.org/10.1093/esr/jci048

General Authority for Statistics. (2019). *Labor market statistics: Fourth quarter, 2019.* General Authority for Statistics, Riyadh, Saudi Arabia. https://www.stats.gov.sa/ar/820

Hensen, M. M., De Vries, M. R., & Cörvers, F. (2009). The role of geographic mobility in reducing education-job mismatches in the Netherlands. *Papers in Regional Science*, *88*(3), 667–682. https://doi.org/10.1111/j.1435-5957.2008.00189.x

Hur, H., Maurer, J. A., & Hawley, J. (2019). The role of education, occupational match on job satisfaction in the behavioral and social science workforce. *Human Resource Development Quarterly*. https://doi.org/10.1002/hrdq.21343

Katz-Gerro, T., & Yaish, M. (2003). Higher education: is more better? Gender differences in labour market returns to tertiary education in Israel. *Oxford Review of Education*, *29*(4), 571–592. https://doi.org/10.1080/0305498032000153089

Kelly, E., O'Connell, P. J., & Smyth, E. (2010). The economic returns to field of study and competencies among higher education graduates in Ireland. *Economics of Education Review*, *29*(4), 650–657. https://doi.org/10.1016/j.econedurev.2009.11.001

Kim H. K., Ahn S. C., & Kim J. (2016). The income penalty of vertical and horizontal education-job Mismatches in the Korean youth labor market: A quantile regression approach. *Hitotsubashi Journal of Economics*, *57*(1), 67–90. https://doi.org/10.15057/27941

Klein, M. (2011). Higher education and non-pecuniary returns in Germany: Tracing the mechanisms behind field of study effects at the start of the career. *Irish Educational Studies*, *30*(2), 253–270. https://doi.org/10.1080/03323315.2011.569144

Krahn, H., & Bowlby, J. (1999). *Education job-skills match: An analysis of the 1990 and 1995 National Graduates Surveys*. (Research Paper No. R-00-101E). Human Resources Development Canada and Centre for Education Statistics, Ottawa, Canada.

Kucel A., Vilalta-Bufi M., & Robert, P. (2011). Graduate labor mismatch in Central and Eastern Europe. (Col.lecció d'Economia Working Paper No. E11/259). Espai de Recerca en Economia, Universitat de Barcelona, Barcelona, Spain.

Kucel, A., & Vilalta-Bufi, M. (2010). *Is there a wage penalty to horizontal and vertical mismatch?* (DEMOSOC Working Paper No. 34). Department of Political & Social Sciences, Universitat Pompeu Fabra, Barcelona, Spain. https://www.upf.edu/documents/3223434/3250685/DEMOSOC34.pdf/6e500ae0-ea61-4dd6-93b8-25e2b58c097c

Kucel, A., & Vilalta-Bufi, M. (2012). Graduate labor mismatch in Poland. *Polish Sociological Review*, *179*(3), 413–429. https://www.jstor.org/stable/41969456

Lee, Y., & Sabharwal, M. (2016). Education–job match, salary, and job satisfaction across the public, non-profit, and for-profit sectors: Survey of recent college graduates. *Public Management Review*, *18*(1), 40–64. https://doi.org/10.1080/14719037.2014.957342

Li, I. W., Harris, M., & Sloane, P. J. (2018). Vertical, horizontal and residual skills mismatch in the Australian graduate labour market. *Economic Record*, *94*(306), 301–315. https://doi.org/10.1111/1475-4932.12413

Little B., & Arthur L. (2010). Less time to study, less well prepared for work, yet satisfied with higher education: A UK perspective on links between higher education and the labour market. *Journal of Education and Work*, *23*(3), 275–296. https://doi.org/10.1080/13639080.2010.484415

McGuinness, S. (2006). Overeducation in the labour market. *Journal of Economic Surveys*, *20*(3), 387–419. https://doi.org/10.1111/j.0950-0804.2006.00284.x

McGuinness, S., Pouliakas, K., & Redmond, P. (2018). Skills mismatch: Concepts, measurement and policy approaches. *Journal of Economic Surveys*, *32*(4), 985–1015. https://doi.org/10.1111/joes.12254

Ministry of Education. (2018). *Higher education statistics 2017-2018* [Data set]. Ministry of Education, Riyadh, Saudi Arabia. https://departments.moe.gov.sa/Statistics/Educationstatistics/Pages/HEStats.aspx

Montt, G. (2017). Field-of-study mismatch and overqualification: Labour market correlates and their wage penalty. *IZA Journal of Labor Economics*, *6*(1). https://doi.org/10.1186/s40172-016-0052-x

Mora, T. (2010). Why do higher graduates regret their field of studies? Some evidence from Catalonia, Spain. *Education Economics*, *18*(1), 93–109. https://doi.org/10.1080/09645290802018001

Nieto, S., Matano, A., & Ramos, R. (2015). Educational mismatches in the EU: Immigrants vs natives. *International Journal of Manpower*, *36*(4), 540–561. https://doi.org/10.1108/IJM-11-2013-0260

Nordin, M., Persson, I., & Rooth, D. O. (2010). Education-occupation mismatch: Is there an income penalty? *Economics of Education Review*, *29*(6), 1047–1059. https://doi.org/10.1016/j.econedurev.2010.05.005

Park, K. (2018). Vertical and horizontal mismatches and career mobility: Evidence from female college graduates. *Asian-Pacific Economic Literature*, *32*(2), 109–125. https://doi.org/10.1111/apel.12246

Robert, P. (2014). Job mismatch in early career of graduates under post-communism. *International Journal of Manpower*, *35*(4), 500–513. https://doi.org/10.1108/IJM-05-2013-0113

Robst, J. (2007a). Education and job match: The relatedness of college major and work. *Economics of Education Review*, *26*(4), 397–407. https://doi.org/10.1016/j.econedurev.2006.08.003

Robst, J. (2007b). Education, college major, and job match: Gender differences in reasons for mismatch. *Education Economics*, *15*(2), 159–175. https://doi.org/10.1080/09645290701263070

Robst, J. (2008). Overeducation and college major: Expanding the definition of mismatch between schooling and jobs. *The Manchester School*, *76*(4), 349–368. https://doi.org/10.1111/j.1467-9957.2008.01064.x

Sellami, S., Verhaest, D., & Van Trier, W. (2018). How to measure field-of-study mismatch? A comparative analysis of the different methods. *LABOUR*, *32*(4), 141–173. https://doi.org/10.1111/labr.12129

Senarath, S., & Patabendige, S. (2014). Job-education mismatch among the graduates: A Sri Lankan perspective. *Ruhuna Journal of Management and Finance*, *1*(2), 1–16.

Shevchuk, A., Strebkov, D., & Davis, S. N. (2015). Educational mismatch, gender, and satisfaction in self-employment: The case of Russian-language internet freelancers. *Research in Social Stratification and Mobility*, *40*, 16–28. https://doi.org/10.1016/j.rssm.2015.02.004

Somers, M. A., Cabus, S. J., Groot, W., & Maassen van den Brink, H. (2019). Horizontal mismatch between employment and the field of education: Evidence from a systematic literature review. *Journal of Economic Surveys*, *33*(2), 567–603. https://doi.org/10.1111/joes.12271

Støren L.A. & Arnesen, C. A. (2011). Winners and losers. In J. Allen & R. van der Velden (Eds.), *The flexible professional in the knowledge society: New challenges for higher education* (pp. 199-240). Higher Education Dynamics, vol 35. Springer. https://doi.org/10.1007/978-94-007-1353-6_8

Tao, H. L., & Hung, C. Y. (2014). Vertical and horizontal educational mismatches of female graduates in Taiwan. *Asian Economic Journal*, *28*(2), 181–199. https://doi.org/10.1111/asej.12032

Verhaest, D., & Omey, E. (2010). The determinants of overeducation: Different measures, different outcomes? *International Journal of Manpower*, *31*(6), 608–625. https://doi.org/10.1108/01437721011073337

Verhaest, D., Sellami, S., & van der Velden, R. (2017). Differences in horizontal and vertical mismatches across countries and fields of study. *International Labour Review*, *156*(1), 1–23. https://doi.org/10.1111/j.1564-913X.2015.00031.x

Witte, J. C., & Kalleberg, A. L. (1995). Matching education and jobs: The fit between vocational education and employment in the German labour market. *European Sociological Review*, *11*(3), 293-317. http://www.jstor.org/stable/522757

Wolbers, M. H. J. (2003). Job mismatches and their labour-market effects among school-leavers in Europe. *European Sociological Review*, *19*(3), 249-266. https://doi.org/10.1093/esr/19.3.249

Zhu, R. (2014). The impact of major-job mismatch on college graduates' early career earnings: Evidence from China. *Education Economics*, *22*(5), 511–528. https://doi.org/10.1080/09645292.2012.659009