

# Wages, Overeducation and Poverty: The Role of Origin and Institutions

**Thesis submitted by Kevin PINEDA-HERNANDEZ**

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Supervisors: Professor François RYCX (Université libre de Bruxelles)  
and Professor Mélanie VOLRAL (Université de Mons)

CEBRIG, DULBEA and Soci&ter

## Thesis jury:

Benoît MAHY (Université de Mons, Secretary)  
François RYCX (Université libre de Bruxelles, Co-supervisor)  
Ilan TOJEROW (Université libre de Bruxelles, Chair)  
Vincent VANDENBERGHE (Université catholique de Louvain)  
Vincenzo VERARDI (Université de Namur)  
Mélanie VOLRAL (Université de Mons, Co-supervisor)

## **GENERAL ABSTRACT**

This PhD thesis contains three analyses: one taking an international approach and two focusing on the Belgian labour market. Using macro-level data for 25 developed countries between 1990 and 2015 and several panel data estimations, the results of Chapter 1 suggest that collective bargaining has a poverty-reducing effect through the interaction between trade unions and the welfare state rather than through its role in wage formation. Using matched employer-employee data for Belgium covering the period 1999-2016, the results of Chapter 2 show that first- and second-generation immigrants from developing countries earn remarkably less than workers born in developed countries (i.e. a persistent intergenerational wage gap). However, most of these gaps are explained by compositional effects (e.g. age, tenure, education and occupation), whose extent considerably varies across generations. Using the same data as in Chapter 2, yet focusing exclusively on tertiary-educated workers, the results of Chapter 3 point out that while immigrant overeducation disappears across two generations among full-time workers, this issue remains intergenerational persistent among part-time workers. Therefore, this PhD thesis provides insightful advice for the implementation of policies and strategies that ensure fair and well-functioning labour markets and social protection systems for people at risk of poverty and/or with a foreign background.

*"They say that curiosity killed the cat,  
but they do not say whether his discovery was worth it."*

José Saramago

*"Many little people, in little places,  
doing little things, can change the world."*

Eduardo Galeano

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## Acknowledgements

A long journey of ten years has come to an end. On 5 August 2013, I decided to buy a one-way ticket from Quito to Brussels. At that point in my life, I lost all hope of attending university. I had tried everything, but without family and financial support, it was practically impossible to study in Ecuador. I arrived in Belgium on 29 September 2013 with the idea of working for some years to save money and then coming back to Ecuador to try to study there again. In my first year in Belgium, I worked in construction, cleaning houses or taking care of children. I was convinced I would do that for a large part of my life. However, in spring 2014, I realised there was a small chance of getting into university while working if I passed some French and economics exams. I succeeded in doing so. Once at university, I could complete my bachelor's and master's studies thanks to the financial support of ULB's "*Fonds Lewin de Castro*" between 2015 and 2019. Likewise, I thank the "*Fonds de la Recherche Scientifique - FNRS*" and its FRESH project for the funding they have granted me to write this doctoral thesis between 2020 and 2024. As an immigrant in Belgium, I am very proud to have written a thesis whose ultimate goal is to provide the adequate mechanisms to fight poverty and inequality and improve the socioeconomic conditions of immigrants and their children.

That said, an essential part of my academic achievements is also due to the support of people who believed in my dreams and encouraged me throughout the journey. Therefore, I wrote this section of my doctoral thesis, especially for them. As I know that I like to write as much as I like to talk, this section is divided into different parts to make it easier to read: i) Thesis supervisors, ii) Thesis jury, iii) Professors, iv) Colleagues, v) Friends and vi) Family.

### i) Thesis supervisors

I am very grateful to François et Mélanie for believing in my research skills. I remember very well when I received their email in May 2019, where they told me that I would start working as a researcher in the next academic year and that they would help me find a grant to finish my PhD. After reading that email, I jumped up and down on my bed as if I had won the lottery. And I was not wrong because François and Mélanie are the best thesis supervisors a PhD candidate can have. They were always there to help me when I had doubts, to motivate me when things were not going well and to celebrate when we finished a project or published an article. Thanks to their trust, I was able to travel around the world presenting our scientific papers, from Ottawa to Tokyo via Warsaw and Marseille. I also thank François for giving me the opportunity

to replace him at the conference on collective bargaining at the University of Lisbon, Portugal. I never imagined that I would share the stage with renowned economists (including a Nobel Prize Winner in Economics) at such a young age in academia.

François and Mélanie have been more than my thesis supervisors. They have been like a family to me these last four years, especially during COVID, when every online meeting with them was like a ray of sunshine in the middle of confinement. I admire them a lot in both professional and human terms. Seeing their dedication, importance and love towards their children, they have become a good example of the father I would love to be in the future. Finally, I hope to be able to continue working with them, either in Belgium or from anywhere in the world.

ii) Thesis jury

I want to thank the members of my thesis jury for meticulously reading my thesis and for their valuable comments, which allowed me to improve the quality of my thesis substantially. Having said that, I would also like to thank them individually because they played a key role in my education and research career. Thanks to his "Applied econometrics" course, Vincenzo Verardi instilled in me his passion for econometrics, to the point of being an econometrics tutor and wanting to be a professor of that course in the future. I will always be indebted to him for all his advice in finding the best econometric model for each chapter of my thesis. If I had done my studies at the UCL, I am convinced I would have liked to have Vincent Vandenberghe as my thesis supervisor. Thanks to his "Labour productivity" course during my doctoral training, my passion for labour economics substantially grew. Having Benoît Mahy as head of service at the UMONS was an honour. I will always remember him as smiling and kind, who only wants the best for all his colleagues. Finally, I was happy to have had Ilan Tojerow as chairman of my thesis jury. Thanks to him, the DULBEA has expanded, and our work is recognised in the academic and institutional world.

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that are so important to make new generations aware of the importance of a fairer society for the future of humanity, but which are sadly disappearing from the curricula of economics faculties). I would also like to sincerely thank Marjorie Gasner for her mathematics courses and colourful notes that made learning formulas and demonstrations easier. I remember when I told her in 2019 that I would do a PhD, but that I would probably need to be a teaching assistant in 2020 to finance it and would like her support. A year later, she remembered me and offered me a position to teach microeconomics and statistics. I am deeply indebted to Marjorie for her crucial support in the beginning of my PhD.

Finally, I would like to thank Catherine Dehon once again for agreeing to chair my defence, despite inviting her at the last minute. I struggled to pass her exams but thanks to her pedagogy, I acquired the statistical tools that are necessary for a good understanding of econometrics. I will always remember her kind and encouraging remark after the exam of "*Analyse statistique multivariée*" in 2018 when she saw that I was reading a book by Leo Tolstoy (*War and Peace*).

#### iv) Colleagues

Perhaps what I liked least about doing this PhD thesis was the working environment at the Faculty of Economics of the ULB (Solvay) because many people prefer to work from home and the interaction between professors and PhD students is minimal, which is not surprising since professors and students are distributed in different buildings. Fortunately, some colleagues did not wholly follow this trend. When they came to the office, talking to them or having lunch together was very easy. I am especially grateful to Esteban, Ashraf, Anna, Caroline, Carmela, Coline, Guida, Justine, Magali, Moritz, Lena, Valerie, Thomas D., Samira, Valentine J., Umut, Ilaria, Anousheh, Tommaso, Riccardo, Nacho, Hassam and Alexis for brightening up the H building. I also thank the members of the CEBRIG and the DULBEA for all the activities and seminars they have organised and for the administrative and financial support that has allowed me to present my scientific papers abroad. I am incredibly grateful to Véronique, Anne-Lise, Emilie, Brune, H  l  ne, Hughes and Virginie. Finally, I would like to thank in a very special way the following colleagues/friends:

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I remember my first day at the UMONS and the kind and cheerful way Valentine F. welcomed me. I thank her for always being there when I needed her help. I never got a no from her. I hope that soon we will write a scientific paper together. I also thank Alexandre for his kindness and support. He was always there to organise fun events and brighten up our days.

Thomas is probably the colleague I have talked to most these last four years. I am very grateful to chance or fate for giving me an office close to Thomas's. Our political, philosophical and historical discussions have allowed me to develop an actual critical spirit and considerably broaden my knowledge. Intellectually, I admire him very much because it is not very common to find someone who has read for pleasure the books of Kundera, Dostoevsky or Tolstoy, for example.

In 2017, Guillaume was my teaching assistant for "*Histoire de la pensée économique*". Thanks to him, I thought about the possibility of doing a PhD for the first time. Two years later, Guillaume and I became colleagues. It was a pleasure to see someone so dedicated to helping others without anything in return. I am very grateful to him for having entrusted me with the coordination of the "*corps scientifique*" and for being the reader of one of my thesis chapters (I am equally grateful to Thomas and Valentine F. for having done the same).

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pay my rent while I found a job and got out of my depression. She always trusted me and was always there to support me, even in her worst moments. Thanks to her, I never felt alone in these ten years in Belgium. If I could put anyone else's name on my university diplomas, I am absolutely sure I would put Miryan's name.

Thanks to Miryan, I could also start working with Mrs. Merali in the carpet business. Although I didn't know it then, it was the best job I could have had. She offered me a flexible job that allowed me to continue studying. Moreover, thanks to that job, I also learned to be more attentive, meticulous and demanding in any area of life. Her teachings were essential for me in order to reach the end of this PhD journey. In sum, she has become like a mother to me.

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### i) Directeurs de thèse

Je suis très reconnaissant à François et Mélanie d'avoir cru en moi. Je me souviens très bien du moment où j'ai reçu leur courriel en mai 2019, dans lequel ils me disaient que je commencerais à travailler en tant que chercheur à partir de l'année académique prochaine et qu'ils m'aideraient à trouver une bourse pour terminer mon doctorat. Après avoir lu ce courriel, j'ai sauté sur mon lit comme si j'avais gagné à la loterie. Et je n'avais pas tort, car François et Mélanie sont les meilleurs directeurs de thèse qu'un doctorant puisse avoir. Ils ont toujours été là pour m'aider lorsque j'avais des doutes, pour me motiver lorsque les choses n'allaient pas bien et pour fêter

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Je remercie chaleureusement mes colocataires (Sarah, Clara et Robin) d'avoir été comme une famille pour moi pendant la majeure partie de mon doctorat. Entre mon obsession pour la propreté et mon complexe de toujours vouloir avoir raison, je sais qu'il ne doit pas être facile d'habiter avec moi. Je les remercie d'avoir rendu ma vie plus joyeuse et plus amusante et de m'avoir préparée pour que je devienne un bon père

vi) Famille

Bien que je n'aie pas reçu le soutien que j'aurais souhaité de la part de ma famille pendant mes études universitaires, certains membres de ma famille ont joué un rôle très important pour que je puisse venir en Belgique. J'aimerais remercier mon oncle Hector de m'avoir prêté l'argent pour acheter le billet d'avion pour Bruxelles et d'avoir été comme un père pour moi pendant mon enfance. Je remercie également ma cousine Tannia d'avoir contacté la personne qui m'a accueilli à Bruxelles et de m'avoir hébergé chez elle durant ma dernière année en Equateur afin que je puisse terminer mes études secondaires.

Enfin, je voudrais remercier ma sœur Britney d'avoir été à côté de moi pendant la dernière ligne droite de mon doctorat. En raison des mauvaises décisions de nos parents, nous avons été séparés et n'avons pas pu nous parler pendant longtemps. Heureusement, nous avons maintenant une belle relation fraternelle. Britney est devenue pour moi une motivation supplémentaire pour terminer mon doctorat. Je suis si heureux de l'avoir retrouvée dans ma vie et je ferai de mon mieux pour que ses rêves se réalisent également.

## Agradecimientos

Un largo viaje de 10 años ha llegado a su fin. Un 5 de agosto de 2013, decidí comprar un billete de avión Quito-Bruselas sin regreso. En ese momento de mi vida había perdido toda esperanza de ir a la universidad. Lo había intentado todo, pero sin un apoyo familiar y económico era prácticamente imposible estudiar. Llegué a Bélgica un 29 de septiembre de 2013 con la idea de trabajar algunos años para ahorrar dinero y luego volver a Ecuador para intentar estudiar nuevamente ahí. El primer año en Bélgica trabajé en la construcción, limpiado casas o cuidando niños. Estaba convencido de que haría eso durante gran parte de mi vida. Sin embargo, en la primavera de 2014, me di cuenta de que había una pequeña posibilidad de entrar a la universidad y poder trabajar al mismo tiempo si aprobaba un examen de francés y economía. Lo logré y una vez en la universidad, debo agradecer infinitamente al “*Fonds Lewin de Castro*” de la ULB por su apoyo económico entre 2015 y 2019 para que pudiera completar mis estudios de licenciatura y maestría. Igualmente, doy las gracias al “*Fonds de la Recherche Scientifique - FNRS*” y su proyecto FRESH por la financiación que me han concedido para escribir esta tesis doctoral entre 2020 y 2024. Como inmigrante en Bélgica, estoy muy orgulloso de haber escrito una tesis cuyo objetivo final es proporcionar los mecanismos adecuados para luchar contra la pobreza y la desigualdad, así como mejorar las condiciones socioeconómicas de los inmigrantes y sus hijos.

Dicho esto, una parte esencial de mis logros académicos se debe también al apoyo de personas que han creído en mis sueños y me han animado a lo largo de este viaje de 10 años. Por lo tanto, escribí esta sección de mi tesis doctoral, especialmente para ellos. Como sé que me gusta escribir tanto como hablar, esta sección está dividida en diferentes partes para facilitar su lectura: i) Directores de tesis, ii) Jurado de tesis, iii) Profesores, iv) Colegas, v) Amigos y vi) Familia.

### i) Directores de tesis

Agradezco mucho a François et Mélanie por creer en mis capacidades de investigador. Recuerdo muy bien cuando recibí su correo electrónico en mayo de 2019, donde me decían que empezaría a trabajar como investigador a partir del próximo año académico y que me ayudarían a encontrar una beca para terminar mi PhD. Tras leer ese e-mail, me puse a saltar de emoción sobre mi cama como si hubiese ganado la lotería. Y no me equivoqué porque François y Mélanie son los mejores directores de tesis que un candidato a doctor puede tener. Ellos siempre estuvieron ahí para ayudarme cuando tenía dudas, para motivarme cuando las cosas no iban

bien y para celebrar cuando terminábamos un proyecto o publicábamos un artículo. Gracias a su confianza pude viajar alrededor del mundo presentando nuestros artículos científicos, desde Ottawa a Tokio, pasando por Varsovia y Marsella. También agradezco a François por haberme dado la oportunidad de remplazarlo en la conferencia sobre negociaciones colectivas en la Universidad de Lisboa, Portugal. Nunca imaginé que al comienzo de mi carrera profesional compartiría el escenario con economistas de renombre (incluso un ganador del Premio Nobel de Economía).

François y Mélanie han sido más que mis directores de tesis. Han sido como una familia para mí en estos 4 años, especialmente durante el COVID, cuando cada reunión en línea con ellos era como un rayo de sol en medio del confinamiento. Los admiro mucho tanto en el ámbito profesional como en el humano. Viendo la dedicación, la importancia y el amor que muestran hacia sus hijos, ellos se han convertido en un buen ejemplo del padre que me encantaría ser en el futuro. Finalmente, espero poder seguir trabajando con ellos, ya sea en Bélgica o desde cualquier parte del mundo.

ii) Jurado de tesis

Me encantaría dar las gracias a los miembros de mi jurado de tesis por haber leído minuciosamente mi tesis y por sus valiosos comentarios, que me permitieron mejorar substancialmente su calidad. Dicho esto, también me gustaría darles las gracias individualmente porque desempeñaron un papel clave en mi educación y mi carrera de investigador. Gracias a su curso de “*Applied econometrics*”, Vincenzo Verardi me inculcó su pasión por la econometría, al punto de ser ahora tutor de econometría y querer ser profesor de ese curso en un futuro próximo. Siempre estaré en deuda con él por todos sus consejos para encontrar el mejor modelo econométrico para cada capítulo de mi tesis. Si hubiese hecho mi maestría en la UCL, estoy convencido de que me habría gustado tener a Vincent Vandenberghe como director de tesis. Gracias a su curso de “*Labour productivity*” durante mi formación doctoral, creció considerablemente mi pasión por la economía laboral. Fue un honor tener a Benoît Mahy como jefe de servicio en la UMONS. Siempre le recordaré como alguien sonriente y amable, que sólo quiere lo mejor para todos sus colegas. Por último, estoy muy contento de haber tenido a Ilan Tojerow como presidente de mi jurado de tesis. Gracias a él, el DULBEA se ha expandido y nuestro trabajo es reconocido en el entorno académico e institucional.

### iii) Profesores

A lo largo de mi licenciatura, maestría y PhD en la ULB, tuve la suerte de contar con muy buenos profesores. Estoy especialmente agradecido a Pierre-Guillaume Méon por haberme explicado muy bien las bases de la macroeconomía, a Michele Cincera por sus cursos y seminarios sobre economía industrial, a Catherine Dehon, Nezar Bennala et Catherine Vermandele por sus cursos de estadística y a Jean-Luc De Meulemeester por sus cursos sobre las desigualdades económicas (cursos tan importantes para concienciar a las nuevas generaciones de la importancia de una sociedad más justa para el futuro de la humanidad, pero que tristemente están desapareciendo de los planes de estudios de las facultades de economía).

También quiero presentar mi más sincero agradecimiento a Marjorie Gasner por sus cursos de matemáticas y sus coloridos apuntes que facilitaban el aprendizaje. Recuerdo cuando en 2019 le dije que iba a hacer un PhD, pero que probablemente necesitaría ser profesor asistente en 2020 para financiarlo y que me gustaría contar con su apoyo. Un año después se acordó de mí y me ofreció un puesto para enseñar microeconomía y estadística. Estoy profundamente agradecido a Marjorie por su apoyo al comienzo de mi doctorado.

Por último, quiero dar las gracias una vez más a Catherine Dehon por haber aceptado presidir mi defensa de tesis, a pesar de haberla invitado en el último momento. Me costó mucho aprobar sus exámenes, pero gracias a su pedagogía adquirí las herramientas estadísticas necesarias para comprender bien la econometría. Siempre recordaré su amable y alentador comentario tras el examen de "*Analyse statistique multivariée*" en 2018, cuando vio que estaba leyendo un libro de León Tolstoi (Guerra y paz).

### iv) Colegas

Quizás lo que menos me gustó de hacer esta tesis doctoral fue el ambiente de trabajo en la Facultad de Ciencias Económicas de la ULB (Solvay) porque hay muchas personas que prefieren trabajar desde casa y la interacción entre profesores y estudiantes de doctorado es mínima, lo cual no es sorprendente, ya que profesores y estudiantes están repartidos en edificios diferentes. Afortunadamente, hay colegas que no siguieron completamente esa tendencia y cuando venían a la oficina, era muy fácil hablar con ellos o quedar para comer juntos. Agradezco sobre todo a Esteban, Ashraf, Anna, Caroline, Carmela, Coline, Guida, Justine, Magali, Moritz, Lena, Valerie, Thomas D., Samira, Valentine J., Umut, Ilaria, Anousheh,

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Recuerdo mi primer d  a en la UMONS y la forma tan amable y alegre con la que Valentine F. me dio la bienvenida. Le agradezco que siempre estuviera ah   cuando necesit   su ayuda. Nunca recib   un no por su parte. Espero que en un futuro pr  ximo podamos escribir un art  culo cient  fico juntos. Tambi  n agradezco a Alexandre su amabilidad y apoyo. Siempre estaba ah   para organizar eventos divertidos y alegrarnos el d  a.

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En 2017, Guillaume fue mi profesor asistente de “*Histoire de la pens   economique*”. Gracias a   l, pens   por primera vez en la posibilidad de hacer un PhD. 2 a  os m  s tarde, Guillaume y yo nos convertir  amos en colegas. Fue un gusto ver a alguien tan dedicado a ayudar a los dem  s sin nada a cambio. Le agradezco bastante por haberme confiado la coordinaci  n del “*corps scientifique*” y por haber sido el lector de uno de mis art  culos de tesis (agradezco igualmente a Thomas y Valentine F. por haber hecho lo mismo).

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¿Qué triste habría sido mi vida sin mis 4 mejores amigos o mejor dicho hermanos: Patri, Bryan, Anthony y Moha? Ha habido muchos momentos en los que ellos han creído mucho más que yo en mis capacidades. Incluso están seguros de que puedo ser presidente de Ecuador dentro de algunos años. Además, debo agradecerles porque me han ayudado en varios momentos críticos e importantes de mi vida. Por ejemplo, Bryan y Anthony me ayudaron mucho en 2010 y 2011 cuando mi familia materna me dio la espalda. Moha vino a visitarme en 2014 a Bruselas cuando a penas dormía 3 horas por día porque estudiaba y trabajaba a tiempo completo. Moha también fue un apoyo importante en 2019 cuando me acompañó a mi entrevista para el PhD en Mons.

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vi) Familia

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Finalmente, quiero dar las gracias a mi hermana Britney por haberme estado a mi lado en la recta final de mi PhD. Debido a las malas decisiones de nuestros padres, estuvimos separados y sin hablarnos por mucho tiempo. Felizmente, ahora siendo adultos podemos tener una bonita relación de hermanos. Britney se convirtió en una motivación extra para que termine mi PhD. Me da tanto gusto tenerla nuevamente en mi vida y haré todo lo posible para que sus sueños también se hagan realidad.

**PART 1**  
**GENERAL INTRODUCTION**

Dealing with poverty and inequality has become one of the most crucial issues in the developed world. Indeed, although Europe is the most egalitarian continent in terms of disposable income, the levels of income inequality have risen in most European countries since the 1980s (Atkinson et al., 2017; Piketty, 2013). Similarly, poverty remains a reality for many people in Europe, even after securing a job. For instance, in 2021, 11.1% of workers aged 18-64 in the European Union (EU) were at risk of poverty or social exclusion after social transfers<sup>1</sup> (i.e. living in households facing at least one of the three risks of poverty and exclusion: income poverty, severe material and social deprivation) (Eurostat, 2023a). While some economists attribute these socioeconomic issues to skill- and task-biased technological change, economic reforms and competition from emerging economies, others ascribe a more central role to the decline of social and labour institutions (Brady et al., 2010; DiNardo and Lee, 2004; Visser, 2016).

In parallel, economic crises, climate change and political instability in developing regions have fuelled migration flows to developed countries in recent decades (Abel et al., 2019; Van Mol and De Valk, 2016). According to Eurostat (2023b), 13.1% of the EU population aged 15-74 were foreign-born in 2021.<sup>2</sup> Among these first-generation (F-G) immigrants, 29.3% were born in another EU country, while 70.7% were born outside the EU (mainly in transition and developing countries). Turning to second-generation (S-G) immigrants in the EU, this group accounted for 7.1% of the EU population aged 15-74 in 2021. Among them, 44.9% had both parents born in the EU, while 55.1% had at least one parent born in a non-EU country.

Despite representing a sizeable share of the EU population, the OECD/EU (2018) points out that F-G immigrants born in non-EU countries have higher unemployment rates and less favourable employment conditions (e.g. overconcentration in low-skilled jobs, overqualification and involuntary part-time work) than EU natives. Focusing on their children, one would expect their labour market situation to be similar to that of EU natives since they are born, educated and socialised from childhood to adulthood in an EU country (i.e. the classical assimilation theory) (Alba et al., 2011; Card, 2005). However, most studies align with the segmented assimilation theory (e.g. Aradhya et al., 2023; OECD/EU, 2018; Piton and Rycx,

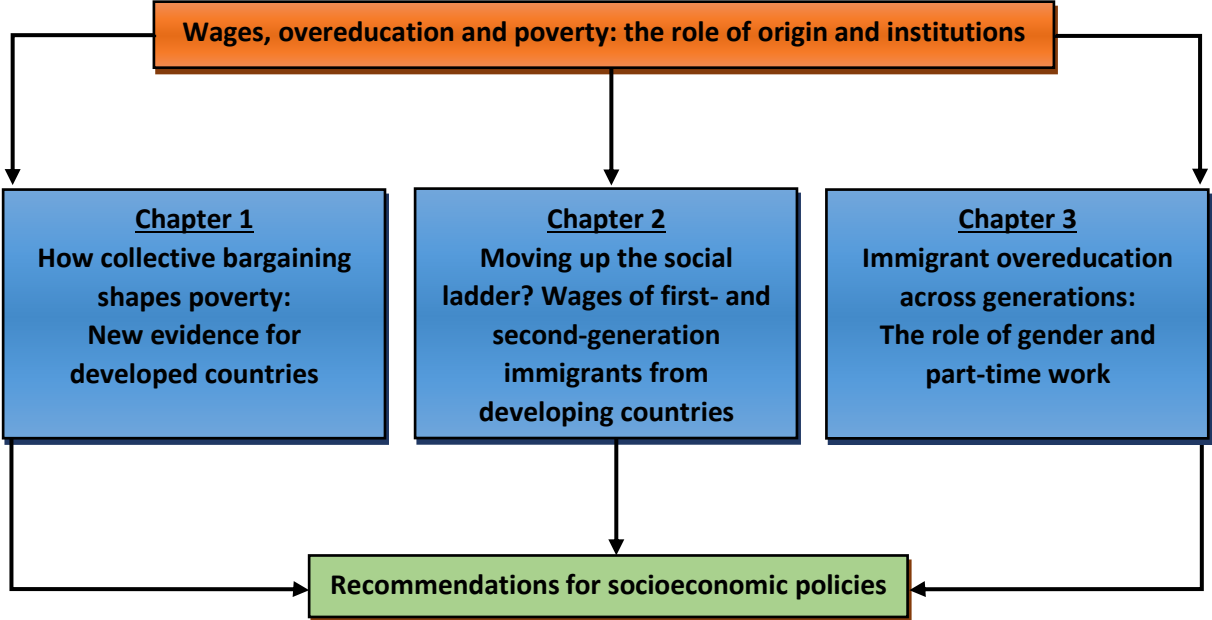
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<sup>1</sup> Persons are considered to be at risk of poverty after social transfers if they have an equivalised disposable income below the risk-of-poverty threshold, which is set at 60 % of the national median equivalised disposable income.

<sup>2</sup> Unless mentioned otherwise, this doctoral thesis henceforth uses the words i) 'first-generation immigrants' and 'foreign-born people' for people born abroad; ii) 'second-generation immigrants', 'children of immigrants' and 'descendants of immigrants' for people born in the host country with at least one foreign-born parent; iii) 'immigrants' for first- and second-generation immigrants; and iv) 'natives' for people born in the host country with both parents born in the host country.

2021; Zschirnt and Ruedin, 2016; Zuccotti and Platt, 2023). Indeed, they show that although S-G immigrants from non-EU countries present better educational outcomes than their F-G counterparts, they are still in a non-favourable position in the European labour market due to the parental transmission of poor socioeconomic characteristics (e.g. overrepresentation in the lowest-income deciles and overconcentration in poor immigrant-dense neighbourhoods) and discrimination or marginalisation associated to their origin (e.g. skin colour, patronymic and religion). Moreover, women with a non-EU background represent a double challenge for European societies. Several studies actually show that F-G female immigrants and their S-G counterparts are exposed to a double penalty in the European labour market due to their gender and foreign origin (e.g. Algan et al., 2010; Athari et al., 2019; OECD, 2020a).

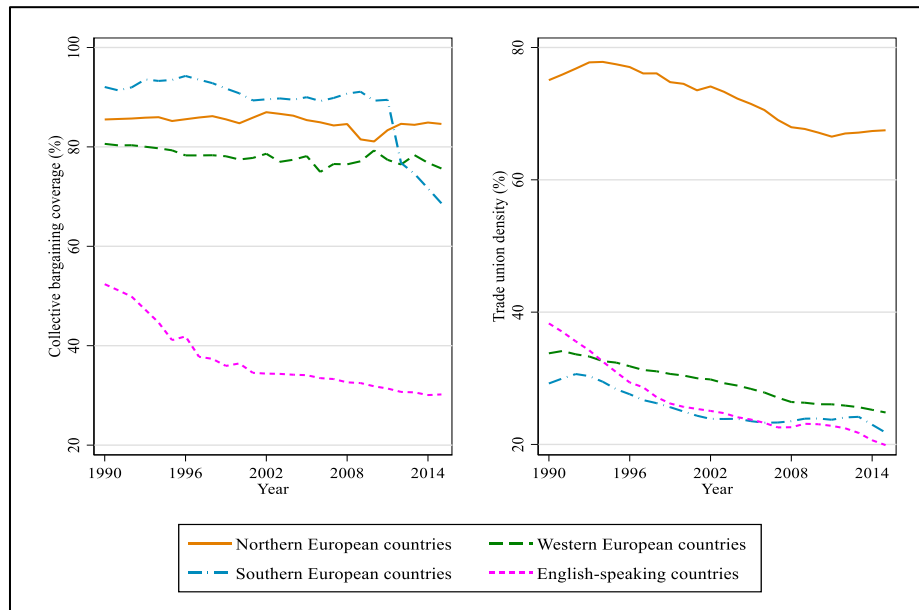
**Figure 1. Structure of the doctoral thesis**



In order to tackle the socioeconomic disadvantages of vulnerable groups, EU institutions (i.e. the European Parliament, the Council and the Commission) set out in 2017 the European Pillar of Social Rights, which represents the main political mechanism to ensure that all workers have the right to take part in decisions that affect them (i.e. a process of collective bargaining), to earn fair wages for a decent standard of living (i.e. reducing the incidence of low pay and in-work poverty) and to receive fair and equal treatment at work (e.g. no discrimination on the grounds of gender and origin) (Garben, 2018). Therefore, in accordance with this European pillar and as illustrated in Figure 1, this doctoral thesis sheds new light on two main axes: i) the role of labour and social institutions in working-age poverty across developed countries

(Chapter 1) and ii) the labour market integration of immigrants across two generations in Belgium (Chapters 2 and 3).<sup>3</sup> The findings of this doctoral thesis further aim to provide insightful guidance for the implementation of policies and strategies that ensure fair and well-functioning labour markets and social protection systems for people at risk of poverty and/or with a non-EU background.

**Figure 2. Evolution of collective bargaining components in developed countries**



*Notes:* Collective bargaining coverage represents the share of workers covered by valid collective agreements in force. Trade union density is the net union membership as a proportion of wage and salary earners. Countries are classified as follows: i) Northern European countries: Denmark, Finland, Iceland, Norway and Sweden; ii) Western European countries: Austria, Belgium, France, Germany, Luxembourg, the Netherlands and Switzerland; iii) Southern European Countries: Greece, Italy, Portugal and Spain; and iv) English-speaking countries: Australia, Canada, Ireland, New Zealand, the UK and the USA. Source: Own calculations using OECD data.

**Chapter 1** studies **the cross-country relationship between collective bargaining (CB) and poverty**. The economic reforms during the 80s and the economic crises at the beginning of the 21<sup>st</sup> century have progressively led to the dismantling and weakening of CB systems in the developed world, especially in English-speaking and Southern European countries (see Figure 2) (OECD, 2018). However, some European countries with widespread collective agreements

<sup>3</sup> Moreover, at the Belgian level, Chapters 2 and 3 are also in line with the 2019-2024 Regional Policy Declaration of Wallonia (Chapter 9: the transversal fight against poverty and reduction of inequalities), the 2019-2024 Common General Policy Declaration of the Government of the Brussels Capital Region (Axis 1.2: Ensuring access to stable and sustainable employment for everyone) and the 2018 Advisory Committee on Economic Migration established by the Social-Economic Council of Flanders.

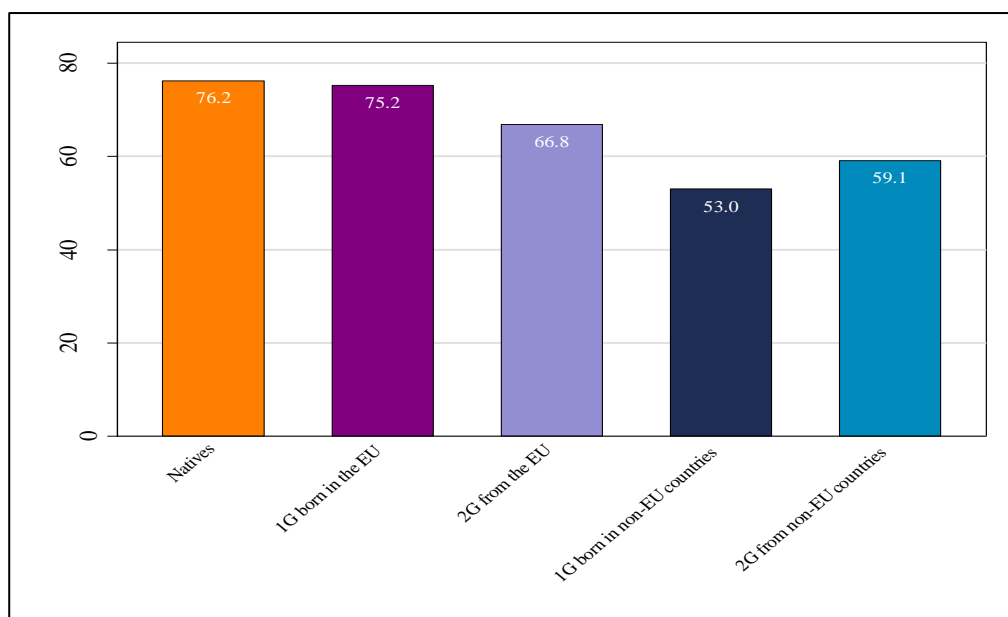
and/or strong trade unions have been somewhat spared of these political and economic shocks (e.g. Belgium, Iceland and Sweden) (Bryson et al., 2011; OECD, 2019a). In line with this heterogeneous context, a growing body of literature has investigated the impact of CB on earnings inequalities from cross- and single-country perspectives (e.g. Garnero, 2021; Visser, 2016; Wallerstein, 1999). Most evidence indicates that countries with strong CB systems record lower earnings inequalities. The primary underlying mechanism of this relationship is that CB establishes an adequate institutional framework for workers (i.e. negotiations take place at the sector or central level), which allows them to organise across firms and sectors (e.g. trade unions) in the search for better wages and employment conditions.

However, the impact of CB on poverty has been largely overlooked by researchers. One potential non-exclusive explanation for this empirical gap is the mistaken assumption of a straightforward relationship between earnings inequalities and poverty (Marx and Nolan, 2012; Salverda, 2016). Indeed, although these social outcomes tend to focus on vulnerable groups, their scope of analysis considerably differs. For instance, earnings inequality indicators only consider the employed population at the worker level, whereas poverty rates cover a larger share of the total population (e.g. the unemployed and inactive) at the household level. Furthermore, unlike earnings inequality indicators, poverty rates in a post-tax benefit scenario also consider taxes and social transfers in their calculations. Therefore, other underlying mechanisms linking CB to poverty must also be considered, in addition to those related to industrial relations (i.e. wages and employment conditions). In this respect, the social-democratic corporatist model highlights the involvement of social partners (i.e. employer organisations and trade unions) in governing bodies in charge of workers' protection and welfare services (e.g. social security systems) (Engler and Voigt, 2023; European Commission, 2016). Similarly, the power resource theory states that trade unions in countries with centralised CB systems represent a sizeable number of workers, allowing them to influence the social program of political parties with a benevolent agenda (Ahlquist, 2017; Brady et al., 2016). Thus, the role of social partners in a country's welfare state can be seen as a key underlying CB mechanism for poverty alleviation.

As far as we know, empirical evidence on the impact of CB on poverty in developed countries is minimal, with four cross-country studies (Brady, 2003; Brady, 2009; Lohmann, 2009; Plasman and Rycx, 2001) and two single-country analyses (Brady et al., 2013; Van Heuvelen and Brady, 2022). In line with the social-democratic corporatist model and the power resource theory, these studies suggest that countries with more centralised CB systems present lower

poverty rates because of their positive relationship with public social spending. However, cross-country evidence is entirely based on old, unbalanced data across short periods and standard regressions with strict econometric assumptions (e.g. pooled OLS or random effect regressions). Therefore, using macro-level data from 24 developed countries between 1990 and 2015 and a solid econometric approach (e.g. two-way fixed effects regressions, an instrumental variable strategy and an overlapping sample estimation), this doctoral thesis contributes to the literature with new empirical evidence on the relationship between CB and poverty in pre- and post-tax benefit scenarios.

**Figure 3. Employment rates in Belgium by origin and generation in 2021**



*Notes:* Employment rates are calculated among the population aged 20-64 in Belgium. S-G immigrants are, on average, younger than natives and F-G immigrants. Therefore, their employment outcomes in this figure must be considered as a lower bound. Source: Own calculations using the 2021 Labour Force Survey.

Chapter 2 then analyses **the intergenerational nexus between origin and wages in Belgium.**

The integration of F-G immigrants and their children has become a significant challenge for European societies. In this regard, Belgium is an interesting case study because it is one of the developed countries with the largest immigrant population. More precisely, 35.8% of people aged 20-64 in Belgium had a foreign background in 2021. Moreover, among them, 1 in 2 immigrants was born or had at least one parent born in a developing country (e.g. the Maghreb, Sub-Saharan Africa and the Near and Middle East) (STATBEL, 2022). However, despite this cosmopolitan context, Belgium ranks as one of the worst OECD countries in the labour market

integration of F-G immigrants born in non-EU countries (Pina et al., 2015; OECD, 2020a). For instance, among the population aged 20-64 in 2021, F-G immigrants born in the EU performed on par with natives in terms of employment (76.2% vs. 75.2%), whereas the employment rate of F-G immigrants born in non-EU countries only reached 53% (see Figure 3). In addition, this integration issue also extends to S-G immigrants from non-EU countries, whose employment rate was 59.1% in 2021. Several empirical studies go in the same direction, highlighting the additional employment barriers F-G immigrants and their descendants face due to their origin (e.g. Corluy et al., 2015; De Cuyper et al., 2018; Piton and Rycx, 2021). At this stage, it is worth noting that immigrants from non-EU developed countries (e.g. Australia, Canada, Japan and the United States) represent less than 5% of the total immigrant population from non-EU countries in Belgium (FPS Employment and Unia, 2022). Therefore, empirical findings and statistics regarding immigrants from non-EU countries mainly concern immigrants from developing countries.

Once in employment, a growing body of literature shows that F-G immigrants born in developing countries receive lower wages than natives (i.e. a sizeable immigrant-native wage gap) and face wage discrimination in Belgium (Fays et al., 2021; Grinza et al., 2020; Kampelmann and Rycx, 2016). However, as far as we know, the wages of S-G immigrants have never been explored in Belgium. Moreover, at the international level, intergenerational studies on the wages of immigrants from developing countries have only been conducted in six developed countries<sup>4</sup> (e.g. Abramitzky et al., 2021; Algan et al., 2010; Duncan and Trejo, 2018; Hammarstedt and Palme, 2012). These studies suggest that the immigrant-native wage gap reduces across generations, albeit the extent of this reduction significantly depends on immigrants' geographical origin and gender.

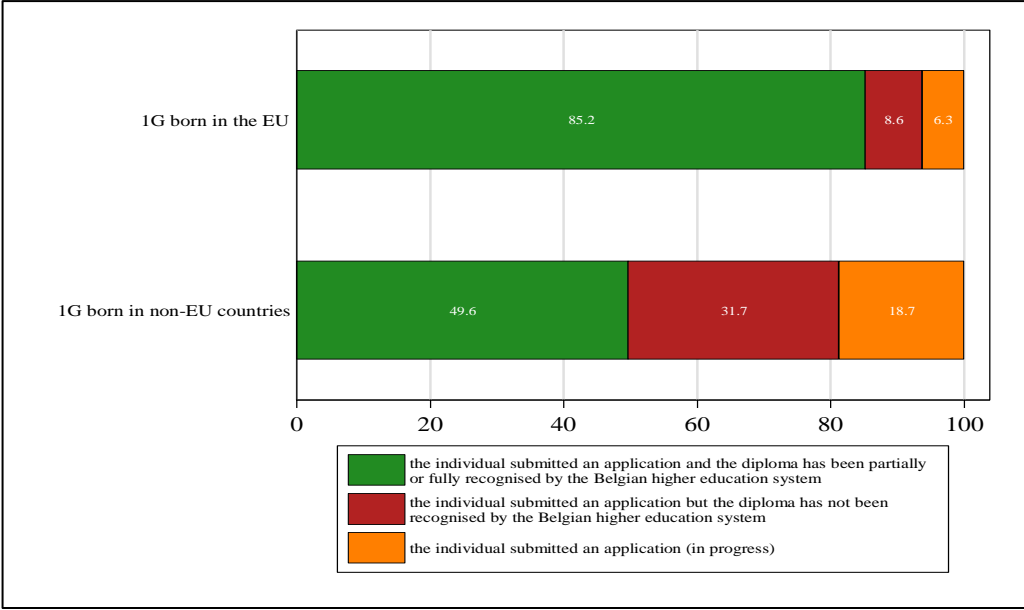
Nonetheless, most evidence presents at least one of the following limitations: i) small samples or short periods, ii) few control variables (i.e. a significant omitted variable bias), iii) no inclusion of F-G immigrants in the regression analysis (i.e. a partial picture of immigrant's labour market performance across generations), and iv) an exclusive OLS approach (i.e. potential estimation issues due to heterogeneity along the wage distribution). Against this background, this doctoral thesis uses a matched employer-employee database of 1.3 million observations, covering the period 1999-2016, advanced econometric techniques (e.g.

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<sup>4</sup> France, Germany, the Netherlands, Sweden, the UK and the USA.

reweighted, recentered influence function Oaxaca-Blinder decompositions) and a sensitivity analysis (i.e. the moderating role of geographical origin, gender and position in the wage distribution) to investigate the wages of immigrants from developing countries across two generations in Belgium.

**Figure 4. Equivalence of foreign tertiary diplomas in Belgium by origin in 2021**



Notes: Population aged 20-64 holding a foreign tertiary diploma in Belgium and who applied for a tertiary diploma equivalence. Source: Own calculations using the 2021 Labour Force Survey.

Finally, Chapter 3 investigates **the intergenerational interplay between origin and overeducation in Belgium**. Although tertiary education expansion is a crucial pillar to ensure the economic and productivity growth of advanced economies in the long run, it can also lead to many overeducation cases (i.e. the fact of having a level of education higher than that required to perform a specific job) (Brunello and Wruunck, 2019; McGuinness, 2006). Moreover, overeducation rates in a country can be fuelled by specific issues related to F-G immigrants, such as the imperfect transferability of human capital, the level of proficiency in the host country’s languages, the knowledge of how the host country’s labour market works and an employment selection according to origin (i.e. discrimination) (Becker, 1957; Zschirnt and Ruedin, 2016).

For instance, in Belgium in 2021, 31.7% of F-G immigrants born in non-EU countries who applied for a diploma equivalence declared that their foreign qualifications were not recognised.

However, this incidence is three times smaller among F-G immigrants born in EU countries who applied for a diploma equivalence (8.6%) (see Figure 4). Moreover, at the international level, a growing body of empirical literature shows that the likelihood of being overeducated for F-G immigrants born in developing countries is substantially higher than that of natives (i.e. evidence of immigrant overeducation) (e.g. Jacobs et al., 2021; McGuinness and Byrne, 2015).

However, evidence is remarkably scarce regarding the overeducation of S-G immigrants. As far as we know, only four studies address intergenerational migration issues regarding overeducation (Dahlstedt, 2015 for Sweden; Falcke et al., 2020 for the Netherlands; Fernández-Reino et al., 2018 for Spain; Larsen et al., 2018 for Norway). They show that, on average, immigrant overeducation reduces or disappears across two generations. Be that as it may, we believe there is room for significant improvement in the regression analysis of immigrant overeducation from an intergenerational perspective. More precisely, evidence is based on unbalanced data or data covering only one year. In addition, the econometric regressions used in previous studies (e.g. logit, probit or linear probability regressions) may not be well-suited to estimate the likelihood of being overeducated, as a worker can be classified in more than two categories (i.e. under-, adequately or over-educated).

Last but not least, previous results are mostly based on samples of workers with any level of education. However, it is unlikely that a worker with at most an upper secondary diploma will be overeducated, which may entail underestimation issues in the likelihood of being overeducated. Therefore, this doctoral thesis leverages a matched employer-employee database of around 400.000 tertiary-educated workers, covering almost two decades (1999-2016), a realized matches approach at the occupation-sector-age level and generalized ordered logit regressions to study the evolution of immigrant overeducation across two generations in Belgium, with a particular focus on the moderating role of gender and part-time work.

The remaining of this doctoral thesis is structured in the following way. Chapter 1 explores how CB shapes poverty in developed countries. Chapter 2 investigates the intergenerational evolution of overall and adjusted immigrant-native wage gaps between workers born in developed countries and workers from developing countries in Belgium. Chapter 3 studies how workers' origin and that of their parents affect their likelihood of being overeducated in Belgium. The final section covers the general conclusion of this doctoral thesis, including socioeconomic policy recommendations and avenues for further research.

**PART 2**  
**ANALYSES**

# Chapter 1

## How collective bargaining shapes poverty: New evidence for developed countries<sup>5</sup>

### Abstract

Although many studies point to the significant influence of collective bargaining (CB) institutions on earnings inequalities, evidence of how these institutions shape poverty rates across developed economies remains surprisingly scarce. This paper explicitly addresses the relationship between CB systems and working-age poverty rates *before* and *after* taxes and transfers in 24 developed countries over the period 1990–2015. Our results show that countries with a more centralised CB system, a more extended bargaining coverage rate and/or a higher trade union density display significantly lower poverty rates. However, these results only hold in a post-tax benefit scenario. Controlling for country and time fixed effects and a wide range of covariates, our estimates indeed suggest that the poverty-reducing effect of CB institutions stems from the political strength of trade unions in promoting public social spending rather than from any direct effect on earnings inequalities. Sensitivity tests for endogeneity and overlapping samples support this conclusion.

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<sup>5</sup> The content of Chapter 1 has been published in the *British Journal of Industrial Relations* as follows: Pineda-Hernández, K., Rycx, F., and Volral, M. (2022). How collective bargaining shapes poverty: New evidence for developed countries. 60(4), 895-928.

Data and STATA do-files that support the empirical findings of this paper are available on request.

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We are very grateful to three anonymous referees and the editor of *British Journal of Industrial Relations* (Prof. Melanie Jones) for their excellent comments, which significantly improved the quality of our manuscript. We are also grateful to Vincenzo Verardi, Dirk Czarnitzki and Caro Verbaeken for their valuable suggestions on earlier versions of this paper. Finally, we would also like to thank Céline Piton, Pierre-Guillaume Méon, Pedro Martins, Yue Huang and the participants of the 33rd Annual Conference of the European Association of Labour Economists (EALE) and the Brown Bag Seminar of CEBRIG (ULB) for their helpful comments.

## 1. Introduction

How do collective bargaining (CB) systems affect inequality and poverty in developed countries? The answer to this question is still largely uncertain and much debated. Some scholars argue that the upward trend in inequality and poverty observed since the 1980s is mainly due to skill- and task-biased technical change, globalisation and specific economic reforms, leaving a marginal role for trade unions and CB (Blank et al., 2007; DiNardo and Lee, 2004; Moller et al., 2009). However, other studies come to quite a different conclusion and attribute a more central role to the characteristics of collective relations (Brady, 2009; Eichhorst and Marx, 2015; Kristal, 2010; Piketty et al., 2014; OECD, 2018). It should be noted, however, that although the impact of CB systems on wage inequalities has been widely studied, surprisingly, few studies have explicitly focused on the impact of CB systems on poverty rates.

There is a widespread view that centralised and coordinated CB systems are associated with less wage dispersion and greater job security. This idea is often justified by the fact that, in countries with such bargaining systems, workers can increase their bargaining power by grouping within companies and/or sectors, and social partners can achieve a higher degree of synchronisation thanks to defined strategies and objectives (Berg, 2015; Bosch, 2015; Hayter, 2011; OECD, 2017a; Visser, 2016). Furthermore, it is argued that these systems reduce earnings disparities by compressing the wage structure of workers covered by collective agreements and by raising the earnings of low-wage workers, e.g. through higher minimum wages (Garnero et al., 2015; Teulings and Hartog, 1998; Wallerstein, 1999). Many empirical studies corroborate these premises (Antonczyk et al., 2010; Busemeyer and Iversen, 2012; Domínguez and Gutiérrez, 2020; Garnero, 2021; Golden and Londregan, 2006; OECD, 2018).

Another strand of the literature suggests that even though greater bargaining coverage may increase the earnings of the population covered by the agreements, a so-called ‘excess’ coverage (relative to union density) may also increase unemployment, thus leading to greater inequality (Aidt and Tzannatos, 2008; Bouis et al., 2012; Chang and Hung, 2016; Jaumotte and Osorio, 2015).<sup>6</sup> The argument is that, in this set-up, trade unions would limit employers’ discretion in hiring and firing decisions and fail to internalise the macroeconomic effects of their decisions. In other words, unions would be strong enough to reinforce employment protection and secure

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<sup>6</sup> ‘Excess’ bargaining coverage has been defined as the difference between the proportion of workers covered by collective agreements and the proportion of workers who are members of a trade union (Bouis et al., 2012).

wage increases but not sufficiently encompassing to ensure that these gains do not come at the expense of overall employment levels.<sup>7</sup> In the same vein, the insider-outsider theory argues that CB can produce greater inequalities by exclusively addressing the interests of the employed (i.e. by raising minimum wages or granting wage increases for specific job titles and sectors), thus hindering access to the labour market for outsiders (i.e. the unemployed) and decreasing total employment in equilibrium (Bertola, 1999; Lindbeck and Snower, 2001). Some empirical papers do support these predictions, but other studies provide a more nuanced view by highlighting the positive role of bargaining coordination in overall employment performance (Boeri and van Ours, 2021; Bouis et al., 2012; Devicienti et al., 2019; Jaumotte and Osorio, 2015; Laroche et al., 2019; OECD, 2018).

Overall, many empirical studies point to a significant influence of CB institutions on earnings inequalities in developed countries (Garnero, 2021; OECD, 2018). However, these studies alone are insufficient to draw clear conclusions about the potential effects of these institutions on poverty rates. There are several reasons for this. First, in terms of measurement, the relationship between earnings inequalities and poverty is not straightforward (Lohmann and Marx, 2018; McKnight et al., 2016). Indeed, while (gross and net) earnings inequalities are measured at the individual level and always refer to those in employment, poverty rates (*before* and *after* taxes and transfers) are calculated at the household level on the basis of equivalised (market and disposable) incomes and usually also refer to other groups of the population such as the unemployed or inactive.<sup>8</sup> Moreover, many low-wage workers are not recorded as poor *after* taxes and transfers. This is because the incomes of other household members, family composition, net social transfers and other income sources are also taken into account in the calculations of equivalised disposable incomes (Marx and Nolan, 2012; Salverda, 2016).

Second, CB institutions, and in particular unions, can affect poverty rates through mechanisms other than those by which they influence wage inequality (i.e. mechanisms for setting wages

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<sup>7</sup> The argument is thus similar to that developed earlier by Calmfors and Driffill (1988) for intermediate systems (i.e. sectoral-level bargaining) as opposed to centralised and decentralised systems. It should, however, be recalled that empirical studies have not provided much support for Calmfors and Driffill's hypothesis and have led to a reconsideration of the OECD stance on sectoral bargaining in 2006 (OECD, 2006) and, even more so, in the 2018 Jobs Strategy. The empirical evidence on the employment consequences of 'excess' bargaining coverage is also not that robust (Jaumotte and Osorio, 2015). For a review of the literature on the interaction between CB systems and employment performance, see for example Garnero (2021).

<sup>8</sup> The equivalised market (disposable) income refers to the total income of a household *before* (*after*) transfers and taxes that is available for spending or saving, divided by the number of household members converted into equalised adults. Household members are equalised or made equivalent by weighting each according to their age, using the so-called 'modified OECD equivalence scale' (Eurostat, 2021).

and working conditions). Indeed, the evidence suggests that unions, when they represent a large share of the workforce and bargain at the sectoral or national level, tend to exhibit sufficient political strength to influence the level of public social spending (Ahlquist, 2017; Brady et al., 2016; Crouch, 2017; Engler and Voigt, 2023; Pontusson, 2013). In other words, the relationship between CB and poverty may also stem from the influence of unions on the size of the welfare state, particularly in countries with extensive bargaining coverage. As an example, Belgium, with its predominantly centralised CB system, features an elaborate national network of consultation structures and social dialogue platforms (e.g. the National Labour Council, the Central Economic Council, and the European Semester), which allows trade unions to be deeply involved in all governing bodies in charge of workers' protection and welfare (i.e. social security institutions) (Eurofound, 2021; Faniel, 2018; Peña-Casas and Ghailani, 2019).<sup>9</sup> Similar legal frameworks and mechanisms linking the level of bargaining to strong union involvement in social security (e.g. unemployment, sickness and injury benefits, parental leave and retirement) are notably found in Denmark, Finland, Iceland, Sweden and Switzerland (Afonso, 2013; Aðalsteinsson and Guðlaugsson, 2019; Van Rie et al., 2011). Furthermore, a less developed literature highlights the potential role of employers' associations in the relationship between collective bargaining systems and social expenditure (Demougin et al. 2019; Fanfani et al. 2021; Martins 2020). The argument is that employers' associations (which tend to be dominated by the most productive/performing firms) have more power, i.e. are more influential political actors, in more centralised CB environments. Moreover, in such environments, employers' associations may also be in favour of higher social expenditure insofar as they provide a means of publicly financing costly fringe benefits (e.g. health insurance, family support, disability benefits and pension schemes) that would otherwise be funded by employers (particularly the most productive/performing ones) on an individual basis for their workers.

Needless to say, the role of CB, and in particular unions, in shaping public social spending can only be tested by focusing on poverty rates *after* taxes and transfers. Overall, while the influence of CB on earnings inequalities can be ascribed to wage-setting dispositions directly (as highlighted by a large strand of the literature, see e.g. Garnero, 2021), the link to poverty is

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<sup>9</sup> The Belgian National Labour Council is an advisory body, which provides advice to a minister or both houses of the legislature (either when consulted or on its own initiative) on general economic and social issues (e.g. public assistance and social legislation). The Central Economic Council has the task of submitting to the government and/or Parliament, at their request or on its own initiative, formal opinions on matters relating to the national economy. The European Semester is a well-established forum for discussing and integrating the monitoring and coordination of economic, employment, and fiscal policies in the European Union (Eurofound, 2021).

likely to be only indirect and mediated by the above-mentioned mechanisms. Therefore, the interplay between CB systems, trade unions and poverty is not straightforward and requires careful attention.

To our knowledge, the link between CB systems and poverty rates has been studied in only six empirical papers so far: four papers adopting a cross-country perspective and two papers focusing on the United States (Brady, 2003; Brady, 2009; Brady et al., 2013; Lohmann, 2009; Plasman and Rycx, 2001; VanHeuvelen and Brady, 2022). These empirical studies suggest that CB is a crucial determinant of poverty reduction because of its positive role in encouraging government social spending, particularly on social security, in a post-tax benefit scenario. However, caution is required as almost all studies on the relationship between CB and poverty focus on rather old, unbalanced data over short periods.<sup>10</sup> Furthermore, to our knowledge, no cross-country study has so far accurately controlled for country fixed effects and endogeneity problems. Therefore, our study contributes to this literature by providing new empirical evidence on how CB systems shape poverty among the working-age population, using macro-level panel data for 24 developed countries over the period 1990-2015 and relying on more solid estimation techniques.<sup>11</sup> Since the main components of CB systems (namely, bargaining coverage, bargaining centralisation, wage-setting coordination and trade union density) tend to be relatively stable over time within countries, we first investigate the long-run relationship between these CB components and the four following outcomes: the incidence of low pay, working-age poverty rates *before* and *after* taxes and transfers, and the level of public social spending. To do so, we use a pooled OLS estimator with time fixed effects and relevant covariates (e.g. demographics, labour market characteristics and macro-economic performance indicators). Second, for CB components with sufficient variability within countries over time (i.e. a relevant signal-to-noise ratio; Swann, 2006), we use a two-way fixed effects (2FE) estimator in order to control for country-level unobserved heterogeneity and common time shocks among countries (i.e. a specification with country and time fixed effects in addition to previously mentioned covariates). Finally, two-way fixed effects two-stage least squares (2FE-2SLS) regressions, along with a bootstrap technique, and estimations in overlapping samples

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<sup>10</sup> This is understandable as the data available at the international level were more limited in the early 2000s.

<sup>11</sup> The working-age population includes all individuals aged 18-64, either employed, self-employed, unemployed, or not in the labour force. The countries covered in our study are the following: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, South Korea, Spain, Sweden, Switzerland, the United Kingdom, and the United States. Our analysis focuses only on those economies that show similarities in their labour market structure and business cycles over the study period in order to facilitate cross-country comparison.

are implemented as sensitivity analyses to deal with endogeneity issues and potential sample composition effects, respectively.

The remainder of this paper is organised as follows. The next section provides a brief review of the literature on the relationship between CB systems and poverty, which further supports the motivation and contribution of our analysis. Section 3 presents our dataset and descriptive statistics. Our empirical strategy and the results of our econometric investigation are shown and discussed in Section 4. The last section concludes.

## 2. Motivation and Literature Review

In order to reduce overall poverty, one of the main goals of policymakers and stakeholders in developed countries is to prevent in-work poverty.<sup>12</sup> This is because most poor people are in wage-earning households and in-work poverty has risen sharply over the last decade, especially among the young, the low-skilled and those with an immigrant background (Brady et al., 2010; Peña-Casas et al., 2019). According to Eurofound (2017), in-work poverty is based on three core pillars: i) family, ii) public welfare and iii) employment. A widespread idea among labour economists is that collective bargaining (CB) influences poverty, *before* taxes and transfers, primarily through the employment pillar, by providing wage coordination, training and job protection to workers at the bottom end of the wage distribution. In addition, through their influence on minimum wages, centralised and coordinated CB systems may not only compress overall wage inequality but also affect poverty rates *before* taxes and transfers by raising the market income of poor households (Garnero et al., 2015). However, higher minimum wages might not be sufficient to lift all vulnerable people out of poverty (Peña-Casas et al., 2019). Many households composed at least partly of unemployed and/or inactive adults will typically benefit less from increased minimum wages. Furthermore, several empirical studies find that raising the minimum wage leads to a large increase in the income of households in the middle of the income distribution but has a modest influence on the bottom quintile since relatively few workers earning a minimum wage live in poor households (Logue and Callan, 2016; Overstreet, 2021; Sabia and Burkhauser, 2010; Sabia, 2014). Nevertheless, turning to a post-tax benefit scenario, the relationship between CB and poverty can also occur through other underlying mechanisms.

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<sup>12</sup> The in-work poverty rate refers to the share of people who are at work and have an equivalised disposable income below the ‘risk-of-poverty’ threshold, which is set at 50 per cent of the national median equivalised disposable income (*after* net social transfers).

The power resource theory (PRT) argues that collective actors are not only involved in the field of industrial relations, where they negotiate better wages and employment conditions, but are also mobilised in policies aimed at strengthening the welfare state for the working class and the poor (Brady et al., 2016; Crouch, 2017; Korpi, 2006; Rudra, 2002). In addition, it is argued that trade unions transform members into more political citizens, who are thereby more strongly involved in strikes and protests and more likely to vote for political parties that promise to implement redistributive policies (Ahlquist, 2017). In this respect, Fanel (2018) states that in most Western European countries, trade unions and party organisations have forged close alliances or political exchanges. Trade unions have also been the main external stakeholders in bringing to the political agenda of European institutions the specificity and urgency for policies to tackle the issue of the working poor (Peña-Casas et al., 2019). Finally, Swank (2020) also suggests that high levels of trade union density go hand in hand with the incorporation of many outsiders in labour movements, which pushes trade unions to pursue social and labour market policies that meet the needs of outsiders.

Moreover, it has been noted that workers turn to trade unions when they can no longer rely on their government for social security in the event of illness, unemployment or retirement (Ingleson, 2000). Lobbying for legislation that increases social benefits for workers and outsiders has thus become a crucial part of the trade unions' tasks (Sen, 2012). This would also apply (at least in part) to liberal regimes, such as the United States, that offer market-based solutions to social problems (Engeman, 2021).

Similarly, the social-democratic corporatist model asserts that organised labour units tend to be actively involved in government decisions to promote benevolent policies (Janoski and Hicks, 1994). In this respect, Lane and Ersson (2004) state that the pressure to increase social spending on family, disability and unemployment benefits stems from the strength of social partners (i.e. employer organisations and labour representatives, usually trade unions) and their interaction with the states. The role of social partners in a country's welfare state can therefore be seen as a key underlying CB mechanism for poverty alleviation. As an illustration, Table 1 provides a general overview of social partners' involvement in the policy-making process of unemployment benefit schemes (a branch of the social security system) in the 24 developed countries covered by our study. In some European countries and South Korea, social partners are consulted or involved in bi/tripartite bodies or committees to discuss the design and development of unemployment benefit schemes (Eurofound, 2013; European Commission,

2016; Hwang, 2013).<sup>13</sup> In addition, trade unions are involved in managing and controlling unemployment insurance (i.e., the so-called Ghent system) in Belgium, Denmark, Iceland, Finland, Sweden and Switzerland.<sup>14</sup> Where appropriate, trade unions are also responsible for collecting contributions to finance unemployment funds.

**Table 1. Social partners' involvement in unemployment benefit schemes**

<b>Policy-making process</b>	<b>Type of involvement</b>	<b>Countries</b>
Involvement in policy designs or reforms	Consultation, elaboration and submission of shared proposals (bipartite social dialogue).	BEL, FIN <sup>1</sup> , FRA
	Systematic participation or advisory function in the decision-making process (tripartite social dialogue).	AUT, CHE <sup>2</sup> , DEU, ESP, ISL, NLD
	Information and consultation (tripartite social dialogue).	KOR, LUX, PRT
	Lobbying type role (participation without involvement).	IRL
	No institutional involvement and occasional consultation.	DNK <sup>3</sup> , GBR, GRC, ITA, NOR, SWE
Involvement in administration	Direct involvement in setting general rules and managing the unemployment benefits system (i.e. Ghent system). Where applicable, collecting contributions for the funds.	BEL <sup>4</sup> , CHE, DNK, FIN, ISL, SWE
	Only advisory or coordination functions and no specific role in the management of programmes.	AUT, FRA, DEU, ESP, GRC, ITA, LUX, NLD, PRT,
	No institutional involvement.	GBR, KOR, IRL, NOR
Other	No institutional involvement in any policy-making process (occasionally administrative and/or informational support to apply for and receive unemployment benefits).	AUS, CAN <sup>5</sup> , JAP, NZL, USA

*Notes:* <sup>1</sup> Systematic involvement in ad hoc tri/bi-partite committees in Finland. <sup>2</sup> Any reform of the Swiss unemployment insurance legislation requires an amendment to the constitution by a vote of a majority of the Swiss electors and the cantons. <sup>3</sup> A reform of the Danish unemployment benefits regime took place in 2010, which has excluded social partners from policy designs or reforms. <sup>4</sup> Belgium has a partial Ghent system where trade unions continue to play a role despite the introduction of compulsory unemployment insurance. <sup>5</sup> Canada abolished the Boards of Referees and Umpire System (tripartite decision-making) in 2013 and replaced it with a Social Security Tribunal, which does not have to transmit information to or consult social partners. Source: Afonso, 2013; Aðalsteinsson and Guðlaugsson, 2019; Eurofound, 2013; European Commission, 2016; Hertel-Fernandez, 2020; Hwang, 2013; Morris and Wilson, 2014; New Zealand Productivity Commission, 2020; OECD 2017a; Schaapman and van het Kaar, 2007; Van Rie et al., 2011; Wood, 2017.

It should be noted, however, that the role of trade unions in social security systems has been under pressure in northern European countries since the early 2000s. Several governments have introduced institutional changes, such as cross-occupational or independent unemployment

<sup>13</sup> In some European countries, this involvement of social partners also applies to active labour market policies (e.g. education and training).

<sup>14</sup> The Ghent system refers to arrangements in which trade unions, on behalf of the government, oversee the payment of unemployment benefits rather than government agencies. This system is named after the Belgian city of Ghent, where it was first implemented.

funds and higher fees for union-controlled unemployment funds. These actions have diminished the number of workers who affiliate with trade unions in pursuit of better social security benefits, consequently waning trade unions' influence on government social affairs (Høgedahl and Kongshøj, 2017; Kjellberg and Ibsen, 2016). Nevertheless, the active participation of social partners in social security institutions remains, albeit to a lesser extent, an essential component of the European social market economy (Bryson et al., 2011; Schnabel, 2013).

**Table 2. The relationship between bargaining centralisation and bargaining coverage in 2015**

		Level of bargaining		
		Low centralisation (Level 1 and 2)	Medium centralisation (Level 3)	High centralisation (Level 4 and 5)
Bargaining coverage	0 - 33%	CAN, GBR, GRC, IRL*, JPN, KOR, NZL, USA		
	34 – 66%	AUS*, LUX*	CHE*, DEU	
	67 – 100%		AUT, DNK, ESP, FRA, ISL, ITA, NLD, PRT, SWE	BEL, FIN, NOR*

*Notes:* The definitions of bargaining centralisation and bargaining coverage are presented in Table 3. \* Bargaining coverage in 2015 was not calculated for Australia, Ireland, Luxembourg, Norway and Switzerland. The closest values are therefore used. Source: OECD/AIAS ICTWSS database.

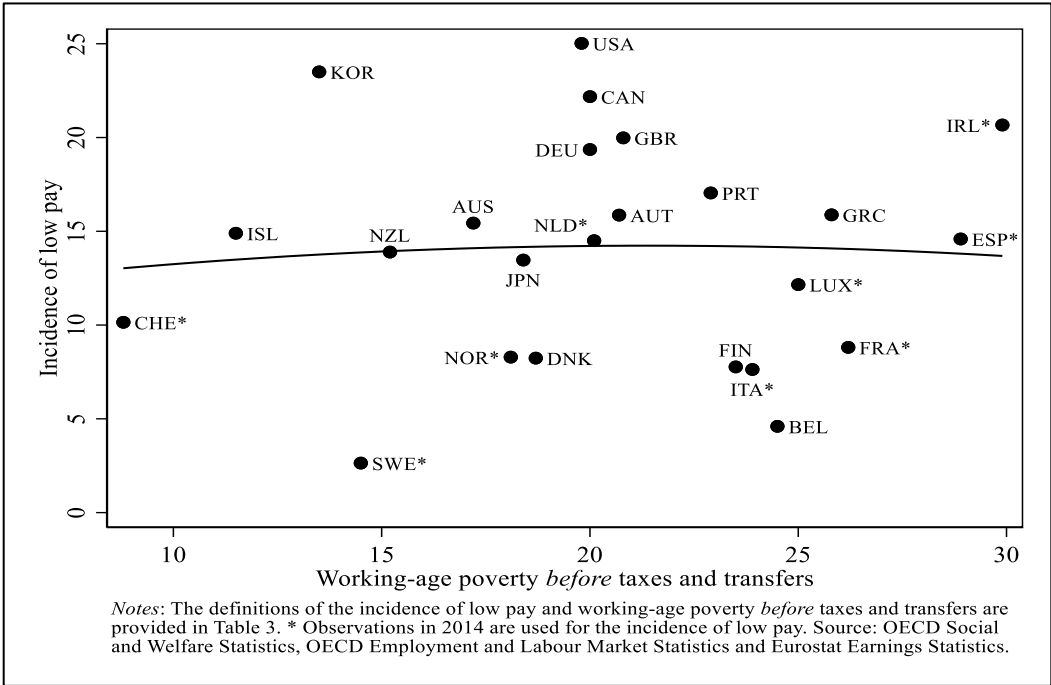
In addition, it is interesting to observe that most countries where trade unions strongly influence social security institutions share commonalities in their CB systems. For example, all countries where the Ghent system has been implemented are characterized by high coverage rates, typically between 80% and 95% (Visser, 2019). This observation is consistent with Pontusson's (2013) assertion that bargaining coverage is an adequate measure of union political strength. His analysis indeed suggests that changes in these two variables have been highly correlated within OECD countries since the 1990s. These variables should, therefore, not be considered in isolation from each other. Moreover, as Schnabel (2020) points out, it should be remembered that the coverage rate is also strongly correlated with the dominant bargaining level (i.e. centralization) in a country. As Table 2 shows, in our sample of 24 developed countries, most countries with medium or high centralization of bargaining have a coverage rate above 67%.

Ahlquist (2017) furthermore argues that trade unions' organisational attributes and involvement in the content of public policy depend on the institutional environment in which these labour representatives operate. On the one hand, if trade unions only bargain at the firm level (i.e. fully or largely decentralised CB), then each trade union, representing a limited and minor number of workers, would have difficulties not only in embedding the cost of its wage settlement for all workers but also in gathering with other counterparts across sectors to have a prevailing political voice. On the other hand, if trade unions are well-organised and negotiate at the sector or central level (i.e. organised decentralised or centralised CB), then all of them, representing a substantial share of the workforce, would obtain sufficient political strength to put pressure on the government's decisions regarding the protection and well-being of workers (i.e. labour market policies and social security expenditure). Furthermore, strong CB institutions allow for centralised consultation bodies and social dialogue committees, which trade unions use to be involved in governing institutions, especially those with social spending responsibilities (Faniel, 2018; Peña-Casas and Ghailani, 2019). In this respect, a series of articles highlights the existence of a significant and positive cross-national link between unionisation rates and redistribution between 1970 and 2010, which is mainly driven by developed countries with predominantly centralised CB systems (e.g. Nordic countries and Belgium) (Bradley et al., 2001; Iversen and Soskice, 2006; Pontusson, 2013). Similarly, using a panel of 21 OECD countries between 1980 and 2013, Engler and Voigt (2023) show that unions have been effective promoters of their members' interests by influencing left-wing political parties to implement more generous labour market-related welfare state programs.

Despite the growing literature on the social consequences of industrial relation systems, the impact of CB systems on poverty rates has been largely overlooked by researchers. This is probably due to the widespread but misleading assumption of a straightforward relationship between earnings inequalities, especially at the bottom end of the distribution, and poverty rates (Lohmann and Marx, 2018; McKnight et al., 2016). First, it should be recalled that unlike gross or net earnings, which are measured at the individual level on an hourly or monthly basis, poverty is calculated annually on the basis of equivalised household incomes. Second, while earnings inequalities are always measured on a sample of employed people, poverty rates usually also take into account other groups in the population (e.g. the unemployed and inactive). Third, it is worth noting that while the risk of poverty for low-wage earners is very high, especially for those who are the sole income earner in a household with or without children, low-wage earners are less likely to be considered poor when they live in multi-person

households (Logue and Callan, 2016). This is because low-pay earners are spread across the entire household income distribution, and only a portion of them end up being poor. For instance, a young person earning a low wage may not be counted as poor because she lives with her parents, who also have financial resources. However, household composition and labour market participation are not the only factors delineating poverty from earnings inequality. Indeed, in a post-tax benefit scenario, poverty rates also take into account net social transfers (e.g. unemployment and disability benefits, pensions and family allowances) and incomes from other sources (e.g. real estate revenues), allowing a high share of low-wage workers to escape poverty (Marx and Nolan, 2012; Salverda, 2016)

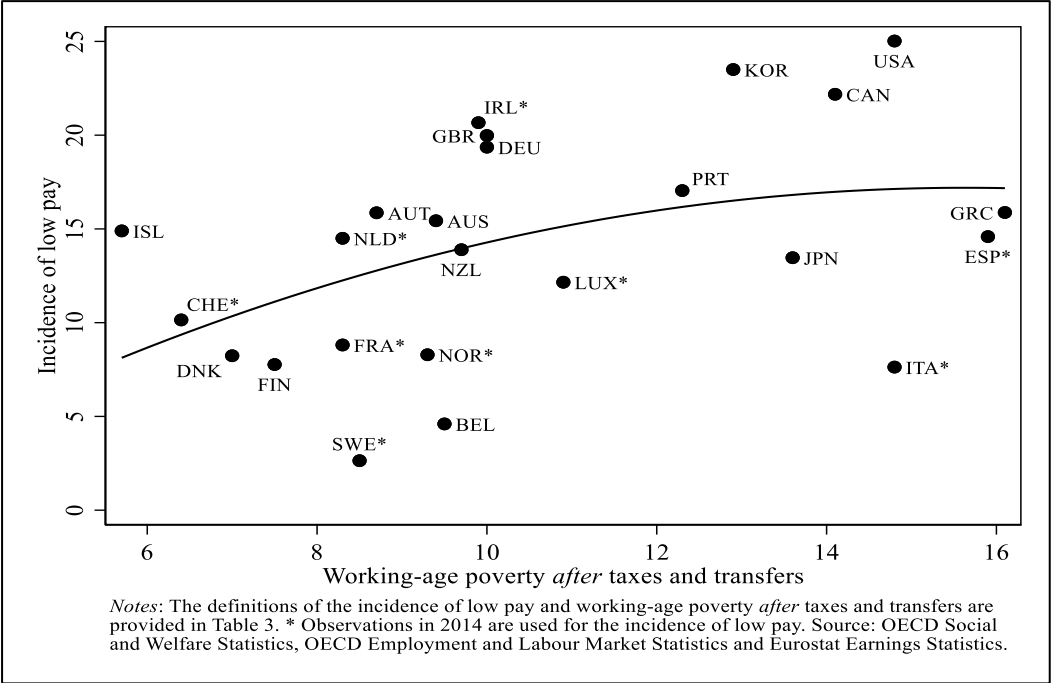
**Figure 1. Incidence of low pay and working-age poverty *before* taxes and transfers, 2015**



To further highlight the difference between earnings inequality and poverty indicators, Figure 1 shows the relationship between the incidence of low pay and working-age poverty *before* taxes and transfers in 2015 in the 24 developed countries covered by our study. As shown in Figure 1, the correlation is extremely weak ( $r = 0.02$ ), illustrating that earnings inequality is a very imperfect proxy for the working-age poverty rate *before* taxes and transfers in developed countries. In contrast, Figure 2 shows a much stronger correlation ( $r = 0.42$ ) between the incidence of low pay and working-age poverty *after* taxes and transfers, reflecting the role of the welfare state in the interaction between these two indicators. Figure 2 also shows that the incidence of low pay is, on average, 3.5 percentage points higher than the working-age poverty

rate in a post-tax benefit scenario.<sup>15</sup> As previously mentioned, this implies that many low-wage workers are, in fact, found in households with incomes above the poverty threshold (i.e. 50 per cent of national median equivalised disposable income). In other words, a significant proportion of those workers escape poverty when taking into account the incomes of other household members, family composition, taxation and social benefits. Therefore, although several empirical papers suggest that CB systems shape earnings inequalities and, in particular, the incidence of low pay, these papers are insufficient to properly understand the impact of CB systems on poverty rates in developed countries.

**Figure 2. Incidence of low pay and working-age poverty *after* taxes and transfers, 2015**



To our knowledge, only six studies have provided an empirical analysis of the relationship between CB systems and poverty. Using a panel of 19 OECD countries for the years 1980, 1990 and 1994 (N = 43) and relying on a pooled OLS estimator with time fixed effects, Plasman and Rycx (2001) point out that centralised bargaining, bargaining coverage and trade union density lower total and working-age poverty rates *after* taxes and transfers because of the positive

<sup>15</sup> There are three countries in Figure 2 where working-age poverty *after* taxes and transfers is significantly higher than the incidence of low pay: Belgium, Italy and Sweden. There are two possible, non-exclusive explanations for this observation. The first is that many workers at the bottom end of the wage distribution are single parents with dependent children or share a household with a part-time worker or an unemployed person, which increases the probability of being poor (Buffel and Nicaise, 2017). The second is that the unemployed and inactive represent most of the poor working-age population in these countries.

influence these variables have on government social security spending.<sup>16,17</sup> Similarly, Brady (2003) and Brady (2009) find that bargaining centralisation, wage-setting coordination and gross union density combine with the welfare state to alleviate state-mediated poverty and overall headcount poverty using panels of industrialized countries (N = 74 between 1967 and 1997 in Brady (2003) and N = 104 between 1969 and 2002 in Brady (2009)) as well as random effects (RE) estimators.<sup>18</sup> Moreover, Lohmann (2009) uses micro- and macro-data for 20 European countries in 2003 and 2004 and a RE logit estimator to show that bargaining centralisation influences in-work poverty and the set-up of the welfare state. Finally, two studies by Brady et al. (2013) and VanHeuvelen and Brady (2022) focus exclusively on the United States. Thanks to unbalanced micro-level panel data for the period 1991-2010 and a fixed effects (FE) logit estimator, Brady et al. (2013) find that unions reduce in-work poverty for both unionised and non-union households by increasing labour income and state transfers in the bottom half of the income distribution. In a complementary study, VanHeuvelen and Brady (2022) use individual-level panel data over the period 1976-2015, in combination with a three-way (person, year and state) FE estimator, to show that: i) union membership and state union density are significantly and negatively related to relative and anchored in-work and working-age poverty;<sup>19</sup> ii) the interaction between union membership and union state density has an additional poverty-reducing effect; and iii) higher state union density has a spillover effect that reduces poverty among non-unionised households without being detrimental to their jobs.

To sum up, we can conclude that studies on the link between CB systems and poverty are scarce, even more so if we consider only those with a cross-country perspective, and that almost all of those studies focus on rather old, unbalanced data over short periods. Moreover, to our knowledge, no cross-country study has so far accurately controlled for country-level, time-invariant unobserved heterogeneity (i.e. country fixed effects) and potential endogeneity issues (which may result, inter alia, from reverse causality).<sup>20</sup> Against this background, our paper

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<sup>16</sup> N indicates sample size, i.e. the total number of observations on which the study in question is based.

<sup>17</sup> This study defines the poverty rate as 50 per cent of the median equivalised income *after* net social security transfers.

<sup>18</sup> State-mediated poverty is also referred to as poverty *after* taxes and transfers (see definition in Table 3). Overall headcount poverty is the percentage of the population concerned with less than 50 per cent of the median income of the whole population.

<sup>19</sup> Relative and anchored in-work poverty are defined as < 50 per cent of median equivalised disposable income in the current year and in 1976, respectively. Working-age poverty is the poverty rate among households headed by people aged 18-64.

<sup>20</sup> Some cross-country studies use a RE estimator because the most significant variation in their dependent variable is between countries. However, this econometric method probably does not adequately control for country fixed

draws on data over the period 1990-2015 for 24 developed countries to provide new, more solid econometric evidence (controlling, *inter alia*, for country and year fixed effects and providing sensitivity tests for endogeneity and overlapping samples) on how the main characteristics of CB systems (e.g. bargaining coverage, trade union density, wage coordination and bargaining centralisation) shape low pay incidence, working-age poverty rates and public social expenditure from a cross-country perspective.

### 3. Data and Descriptive Statistics

Our dataset contains macro-level information collected on a yearly basis for 24 developed countries over the period 1990-2015. The aggregated data used in this research come from the OECD, LIS, ILO, Eurostat and OECD/AIAS ICTWSS databases.<sup>21,22,23</sup> The precise definitions and sources of all dependent and explanatory variables used in this cross-country analysis are provided in Table 3, and the summary of descriptive statistics is reported in Table 4.

#### 3.1 Dependent variables

To explore the relationship between collective bargaining (CB) systems and poverty rates, and to examine how this relationship differs from that with wage inequality, we selected four indicators as dependent variables. The first indicator is the incidence of low pay. Table 4 shows that, on average, 15.7 per cent of workers earn less than two-thirds of the gross median earnings in our panel of developed countries.<sup>24</sup> The second indicator is the working-age poverty rate *before* taxes and transfers, which shows that 20.2 per cent of the working-age population in our panel of developed countries is, on average, considered poor when focusing on equivalised household market incomes.<sup>25</sup>

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effects. Indeed, it is not so obvious to assume that all the explanatory variables are uncorrelated with country fixed effects and that the latter follow a homogenous empirical distribution, two of the main conditions of the RE model to provide efficient and consistent estimates.

<sup>21</sup> OECD: Organisation for Economic Co-operation and Development; LIS: Luxembourg Income Study; ILO: International Labour Organisation; AIAS: Amsterdam Institute for Advanced Labour Studies; ICTWSS: Institutional Characteristics of Trade Unions, Wage Setting, State Intervention, and Social Pacts.

<sup>22</sup> To merge observations over time from different sources, we notably relied on the Standardized World Income Inequality (Solt, 2019) and Comparative Welfare States (Brady et al., 2014) datasets.

<sup>23</sup> In 2021, the ICTWSS database has been rebranded as the OECD/AIAS ICTWSS database. This new name reflects the effort of the OECD and AIAS-HIS to develop and consolidate earlier versions of the ICTWSS database with the aim of ensuring the continuation of Jelle Visser's work after his retirement.

<sup>24</sup> The following countries have only three observations available before 2015 for the incidence of low pay: France, Norway and Sweden.

<sup>25</sup> Other poverty indicators have also been considered as dependent variables (e.g. in-work poverty, at-risk-of-poverty, headcount poverty and poverty intensity). However, these indicators were unavailable for some developed

**Table 3: Definitions of variables**

Variable	Description
<b>Dependent variables</b>	
Incidence of low pay	The share of full-time workers earning less than two-thirds of the gross median earnings of all full-time workers (excluding apprentices). Source: OECD Employment and Labour Market Statistics and Eurostat Earnings Statistics.
Working-age poverty rate <i>before</i> taxes and transfers <sup>a</sup>	The ratio of the number of people among the working-age population whose household market income per equivalent household member falls below the poverty line, which is set at 50% of the median equivalised market income of the working-age population. Source: OECD Social and Welfare Statistics and LIS database.
Working-age poverty rate <i>after</i> taxes and transfers <sup>a</sup>	The ratio of the number of people among the working-age population whose household disposable income per equivalent household member falls below the poverty line, which is set at 50% of the median equivalised disposable income of the working-age population. Source: OECD Social and Welfare Statistics and LIS database.
Public social spending as a % of GDP	<p>Social expenditure comprises cash benefits, direct in-kind provision of goods and services, and tax breaks with social purposes. This aggregate is calculated as a percentage of gross domestic product and accounts for nine social branches:</p> <ul style="list-style-type: none"> <li>- Active labour market programmes: employment services, training, employment incentives, integration of the disabled, direct job creation and start-up incentives;</li> <li>- Family: child allowances and credits, childcare support, income support during leave and single parent payments;</li> <li>- Health: spending on in- and out-patient care, medical goods and prevention;</li> <li>- Housing: housing allowances and rent subsidies;</li> <li>- Incapacity-related benefits: care services, disability benefits, benefits accruing from occupational injury and accident legislation and employee sickness payments;</li> <li>- Old age: early retirement pensions, home-help and residential services for the elderly;</li> <li>- Survivors: pensions and funeral payments;</li> <li>- Unemployment: unemployment compensation, early retirement for labour market reasons and;</li> <li>- Other social policy areas: non-categorical cash benefits to low-income households and/or other social services.</li> </ul> <p>Source: OECD Social and Welfare Statistics.</p>
<b>Components of collective bargaining<sup>b</sup></b>	
Bargaining centralisation	<ul style="list-style-type: none"> <li>• Level 1: bargaining predominantly takes place at the local or company level;</li> <li>• Level 2: intermediate or alternating between sector and company bargaining;</li> <li>• Level 3: bargaining predominantly takes place at the sector or industry level;</li> <li>• Level 4: intermediate or alternating between central and industry bargaining, and;</li> <li>• Level 5: bargaining predominantly takes place at central or cross-industry level negotiated at lower levels.</li> </ul>
Wage coordination	<ul style="list-style-type: none"> <li>• Degree 1: fragmented wage bargaining, confined largely to individual firms or plants;</li> <li>• Degree 2: mixed industry and firm-level bargaining, weak government coordination through minimum wage setting or wage indexation;</li> <li>• Degree 3: negotiation guidelines based on centralised bargaining;</li> <li>• Degree 4: wage norms based on centralised bargaining by peak associations with or without government involvement, and;</li> <li>• Degree 5: maximum or minimum wage rates/increases based on centralised bargaining.</li> </ul>
Bargaining coverage	It represents the share of workers covered by valid collective agreements in force (i.e. percentage of people with the right to bargain). What counts as a valid collective agreement in force is defined by international and national legislations and, in some cases, tribunals.
Trade union density	It is the net union membership as a proportion of wage and salary earners in employment.

*Notes:* <sup>a</sup> Data on working-age poverty rates *before* and *after* taxes and transfers were downloaded from the OECD Social and Welfare Statistics. However, for some countries in the early 1990s, these data were supplemented with information from an archival source, Smeeding (1997), who relied on the LIS to make his calculations. <sup>b</sup> Source: OECD/AIAS ICTWSS database.

countries or only available for a limited number of years, which could lead to biased and/or inconsistent estimates. For these reasons, we decided to focus exclusively on working-age poverty rather than on these other indicators.

The third indicator is the working-age poverty rate *after* taxes and transfers.<sup>26</sup> In a post-tax benefit scenario, only 9 per cent of the working-age population, on average, is still considered poor. The welfare state, which includes social protection spending, social security transfers and decommodification, is indeed an important and powerful driver of poverty reduction (Brady, 2009). Based on this observation and in order to better understand through which channel CB systems can shape poverty, our fourth dependent variable is the level of public social expenditure as a percentage of GDP, which accounts for nine social branches: active labour market programmes, family, health, housing, incapacity-related benefits, old age, survivors, unemployment and other social policy areas. This fourth dependent variable can be seen as a proxy for a country's welfare state, as it mainly includes social expenditure for low-income households and vulnerable groups. On average, public social expenditure represents 20.5 per cent of GDP in our panel.

### 3.2 Explanatory variables

To assess the heterogeneity of CB systems over time and across countries, we relied on the detailed classification of CB components included in the OECD/AIAS ICTWSS database. This classification makes it possible to identify the following four components of CB systems: i) bargaining centralisation, which is measured as the level of bargaining scored from 1 to 5, with 5 being predominantly high centralisation; ii) wage coordination, which defines how wages are set and synchronised between the social partners, scored from 1 to 5, with 5 being predominantly high coordination; iii) bargaining coverage, which is the percentage of workers covered by collective agreements, reaching 66 per cent on average; and iv) union density, which is the proportion of unionised wage and salary earners in employment, standing at 35.9 per cent on average.<sup>27</sup>

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<sup>26</sup> Working-age poverty also has a comparative advantage over other poverty indicators when estimating the social consequences of CB in a post-tax benefit scenario. Indeed, working-age poverty takes into account not only full-time workers but also part-time workers, the unemployed and people of working age out of the labour force, who are more likely to receive social benefits.

<sup>27</sup> The OECD/AIAS ICTWSS database also provides information on two other CB systems features: flexibility and favourability (Visser, 2019). Flexibility specifies whether it is possible to derogate from terms established by law (and offer less favourable conditions) by means of collective agreement. Favourability delineates the hierarchy between agreement levels. Our study does not consider these two features of CB systems since there is no clear theoretical explanation or economic mechanism describing their relationship with working-age poverty rates and public social spending. Moreover, it should be noted that their inclusion in our econometric models does not affect our conclusions (i.e. it does not change the statistical significance or sign of our estimates, and the size of our estimates remains largely unchanged). In addition, the adjusted R-squared of all our specifications hardly increases after the inclusion of flexibility and favourability among the covariates.

**Table 4. Selected descriptive statistics, 1990-2015**

	Mean	SD	Min	Max	
<u>Dependent variables</u>					
Incidence of low pay	15.7	5.6	1.8	26.0	
Working-age poverty rate					
<i>Before</i> taxes and public transfers	20.2	5.1	6.6	37.0	
<i>After</i> taxes and public transfers	9.0	3.0	3.5	17.9	
Public social spending as a % of GDP <sup>a</sup>	20.5	5.6	2.6	34.2	
<u>Explanatory variables<sup>b</sup></u>					
Bargaining coverage	66.0	29.1	12.2	100.0	
Trade union density	35.9	22.1	8.5	92.5	
<u>Control variables</u>					
Demographics	Educational attainment	39.8	11.5	8.4	61.9
	Youth population	18.1	2.7	12.6	27.2
	Children in unemployed single-parent households	34.3	11.1	7.6	60.1
Labour market characteristics	Unemployment rate	7.2	4.1	1.5	27.5
	Inactivity rate	27.2	6.4	11.6	42.1
	Labour productivity growth	1.6	1.9	-5.8	14
Macroeconomic performance	Output gap	-0.6	3.0	-15.5	9.7
	Inflation	2.5	2.3	-4.5	20.4
	Short-run interest rate	4.5	3.8	-0.8	18.3
	Terms of trade	7.4	6.0	-13	27.7

*Notes:* <sup>a</sup> The decomposition of public social spending by social branch as a percentage of GDP is provided in Appendix 3. <sup>b</sup> The values of the categorical explanatory variables (in 1990 and 2015) used in our study are reported in Appendix 1. The definitions and sources of the control variables are presented in Appendix 2. Source: OECD, ILO, LIS, Eurostat and OECD/AIAS ICTWSS databases.

Furthermore, to bring out more accurate estimates of the association between CB components and the four dependent variables, our database also includes a set of control variables that are consistent with those used in previous studies, namely demographics (i.e. educational attainment, the fraction of youth population and the share of children in unemployed single-parent households), labour market characteristics (i.e. the unemployment rate, the inactivity rate and the labour productivity growth), and macro-economic performance indicators (i.e. the output gap, inflation, the short-run interest rate and the terms of trade).<sup>28</sup> The intuition for including these covariates in our model is as follows. Education is recognized as a tool for poverty reduction as it leads to the accumulation of human capital, which is associated with higher earnings (Tilak, 2002). The incidence of poverty varies throughout the life cycle, with childhood and jobless parenthood being identified as the most vulnerable stages (Aassve et al.,

<sup>28</sup> The definitions and sources of the control variables are presented in Appendix 2.

2005). The risk of ending up living in a poor household is higher for the unemployed and inactive people (Martínez et al., 2001). Lower productivity often leads to lower earnings for workers, which potentially contributes to poverty (Vandenberg, 2004). Inflation can expand poverty if the increase in nominal wages is less than in the price of goods and services consumed by workers (Cardoso, 1992). Finally, the output gap, the short-run interest rate, and the terms of trade enable us to account for the influence of the business cycle.

## 4. Empirical Strategy and Results

### 4.1. Collective bargaining components and poverty

Since collective bargaining (CB) components generally show little variation over time within a country, we first estimated the long-run association between CB characteristics and our four dependent variables using a pooled OLS estimator with year fixed effects and robust standard errors clustered at the country level. This methodology allows us to focus on cross-country and historical variations while controlling for time shocks, heteroscedasticity and serial correlation in the error term. We also added a wide set of control variables (described at the end of Section 3). Our benchmark specification has thus been defined as follows:

$$Y_{c,t} = \beta_0 + \mathbf{CB\ components}_{c,t}\boldsymbol{\beta} + \mathbf{X}_{c,t}\boldsymbol{\phi} + \delta_t + \varepsilon_{c,t} \quad (1)$$

where  $Y_{c,t}$  represents either the incidence of low pay, working-age poverty *before* taxes and transfers, working-age poverty *after* taxes and transfers or public social spending as a percentage of GDP in country  $c$  at year  $t$ ;  $\mathbf{CB\ components}_{c,t}$  are our main explanatory variables, namely the bargaining coverage, the trade union density, the degree of wage coordination and the level of bargaining centralisation;  $\mathbf{X}_{c,t}$  is a vector of control variables (see description in Section 3),  $\delta_t$  represents 25 time dummies, and  $\varepsilon_{c,t}$  is the error term clustered at the country level.<sup>29,30</sup>

Table 5 first reports the results for the relationship between CB components and the incidence of low pay. Estimates show that the incidence of low pay is significantly lower in countries with a higher proportion of workers covered by collective agreements and/or affiliated with a

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<sup>29</sup> For a detailed description of the four components of CB, see Table 3.

<sup>30</sup> To avoid a reduction in the sample size, we applied an interpolation technique to our control variables and included dummies for missing observations.

trade union (see column 1). This finding is consistent with previous empirical results on the cross-country relationship between CB systems and wage compression at the lower end of the wage distribution (Busemeyer and Iversen, 2012; Garnero, 2020; Garnero et al., 2015; Wallerstein, 1999).

**Table 5. Pooled OLS estimator: collective bargaining components and poverty**

Dependent variable:	The incidence of low pay	Working-age poverty rate before taxes and transfers	Working-age poverty rate after taxes and transfers	Public social spending as a % of GDP
	(1)	(2)	(3)	(4)
Bargaining coverage	-0.127*** (0.026)	0.014 (0.023)	-0.049*** (0.015)	0.135*** (0.028)
Trade union density	-0.112*** (0.024)	0.002 (0.023)	-0.031** (0.013)	0.072** (0.030)
Wage coordination	-0.239 (0.667)	0.738 (0.588)	0.060 (0.283)	-0.293 (0.336)
Bargaining centralisation	-0.236 (0.716)	-0.318 (0.501)	-0.112 (0.300)	-0.184 (0.454)
<b>Estimator</b>	<b>Pooled OLS</b>	<b>Pooled OLS</b>	<b>Pooled OLS</b>	<b>Pooled OLS</b>
<b>Control variables<sup>a</sup></b>				
Demographics	Yes	Yes	Yes	Yes
Labour market characteristics	Yes	Yes	Yes	Yes
Macroeconomic performance	Yes	Yes	Yes	Yes
Year fixed effects <sup>b</sup>	Yes	Yes	Yes	Yes
Observations	371	487	505	624
Panel of countries	24 <sup>c</sup>	24	24	24
Adjusted R-squared	0.76	0.69	0.70	0.78

Notes: \*\*\*/\*\*/\* significant at the 1, 5 and 10% level. Clustered standard errors at the country level are denoted in parentheses.

<sup>a</sup> Demographics: educational attainment, youth population and children in households where the sole parent is not in employment. Labour market characteristics: inactivity rate, labour productivity growth and unemployment rate. Macroeconomic indicators: inflation, output gap, short-run interest rate and terms of trade. <sup>b</sup> 25 year dummies. <sup>c</sup> The following countries only show three available observations for the incidence of low pay: France, Norway and Sweden. Source: OECD, ILO, LIS, Eurostat and OECD/AIAS ICTWSS databases, 1990-2015.

However, it cannot be taken for granted that due to a lower incidence of low pay, countries with widespread bargaining coverage and/or strong trade unions also show lower poverty levels. Indeed, the relationship between CB and earnings inequalities may differ from the relation between CB and poverty for three main reasons: i) differences of measurement because the incidence of low pay relies on gross median earnings on an hourly or monthly basis, while poverty rates are based on equalised market or disposable household incomes on a yearly basis; ii) sampling differences, as earnings inequalities are always measured on a sample of employed people, while poverty is usually measured by including other groups of the population, such as the unemployed or inactive; and iii) the role of CB (and in particular unions)

in shaping poverty (after taxes and transfers) through the welfare state, which can only be observed in a post-taxes and transfers scenario, i.e. using equivalised disposable household incomes (see Section 2 for a detailed discussion). Column (2) supports the divergence in outcomes for earnings inequalities and poverty rates as none of the four components of CB is significantly correlated with working-age poverty *before* taxes and transfers. However, in a post-tax benefit scenario, working-age poverty is significantly and negatively related to both the trade union density and bargaining coverage (see column (3)).

In previous studies, CB and trade unions have been associated with lower poverty rates because of their political role in the development of the welfare state (Brady, 2003; Brady, 2009; Brady et al., 2013; Lohmann, 2009; Plasman and Rycx, 2001; VanHeuvelen and Brady, 2022). Using public social spending, represented as a percentage of GDP, as a proxy for the welfare state, our estimates confirm and extend these earlier results. Specifically, our estimates, presented in column (4), show that public social spending is higher in countries with higher levels of unionisation and bargaining coverage.

Since the bargaining coverage rate is highly correlated with the degree of bargaining centralisation in our panel of countries ( $r = 0.73$ ) (see also Table 2), we also estimated two slightly modified versions of equation (1), each taking one of these CB components on board. Results in Appendix 4 show that regressions coefficients associated with the bargaining coverage remain very similar to those presented in Table 5 when not controlling for bargaining centralisation. Regarding coefficients for bargaining centralisation, as expected, they are now significant and negative when focusing on the incidence of low pay and working-age poverty *after* taxes. Moreover, when examining public social spending, the association with bargaining centralisation becomes significant and positive (as previously found between public social spending and bargaining coverage).

Overall, our estimates suggest that the political influence of trade unions on redistributive policies – and hence their capacity to shape poverty rates – depends positively on both the number of unionized workers and the CB coverage rate. Put differently, our results support the hypothesis that centralized bargaining regimes allow for better coordination of unions at the sectoral and national levels and thus create more opportunities and channels for unions to interact with policymakers and, in particular, to influence their decisions regarding the level of public social spending.

However, this first conclusion should be taken with caution because, despite the inclusion of a wide range of covariates and time fixed effects, our specifications may not fully capture time-invariant unobserved heterogeneity at the country level. This econometric limitation to the interpretation of our results is common to all studies that have so far examined the relationship between CB and poverty from a cross-country perspective.<sup>31</sup> Nevertheless, we will attempt to go a step further in the following Subsection by explicitly taking these country fixed effects into account in order to obtain more robust estimates for CB components with a relevant within-country variation.

#### 4.2. Trade union density and poverty

We performed a Chow test and a Hausman test to test for the presence of time-invariant, unobserved heterogeneity at the country level and assess whether these country fixed effects are correlated with the regressors.<sup>32</sup> The results indicate that the null hypotheses of no country fixed effects and no correlation between these fixed effects and the regressors should both be rejected.<sup>33</sup> We, therefore, decided to opt for a two-way fixed effects estimator (2FE), that is to estimate the following mean-differentiated version of equation (1) with time fixed effects ( $\delta_t$ ):

$$(Y_{c,t} - \bar{Y}_c) = (\mathbf{CB\ components}_{c,t} - \overline{\mathbf{CB\ components}_c})\boldsymbol{\beta} + (\mathbf{X}_{c,t} - \bar{\mathbf{X}}_c)\boldsymbol{\phi} + \delta_t + (\varepsilon_{c,t} - \bar{\varepsilon}_c) \quad (2)$$

where  $\bar{Y}_c$ ,  $\overline{\mathbf{CB\ components}_c}$ ,  $\bar{\mathbf{X}}_c$ , and  $\bar{\varepsilon}_c$  represent the average values of the dependent variable ( $Y$ ), the four components of CB ( $\mathbf{CB\ components}$ ),<sup>34</sup> the control variables ( $X$ ) and the error term ( $\varepsilon$ ), respectively, in country  $c$  over all the years studied (i.e. from 1990 to 2015).<sup>35</sup>

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<sup>31</sup> It is mainly because institutions vary little over time, making the use of panel estimation techniques difficult.

<sup>32</sup> The null hypothesis of a Chow test for country-level time-invariant, unobserved heterogeneity is that the fixed effects (i.e. the intercepts) are identical across countries. The rejection of this null hypothesis implies that panel data estimations methods, controlling for these country-fixed effects, should be preferred to the pooled OLS estimator. The null hypothesis of a Hausman test is that there is no correlation between the country-level fixed effects and the regressors. The rejection of this null hypothesis implies that the fixed effects (FE) estimator should be preferred to the random effects (RE) estimator.

<sup>33</sup> The results of the Chow and Hausman tests are available on request.

<sup>34</sup> As highlighted in Subsection 4.1, the four CB components are the following: bargaining coverage, trade union density, wage coordination, and bargaining centralisation.

<sup>35</sup> A detailed description of the variables included in equation (2) is provided in Subsections 3.1 and 3.2.

Before continuing, it is worth noting that a 2FE estimator cannot properly assess the effect of regressors that have little within-group variation (Wooldridge 2010). As CB characteristics generally show little variation over time within countries, we conducted an analysis of variance (ANOVA) for the four components of CB under study to determine which components show sufficient within-country variation for meaningful use of the 2FE estimator. This analysis indicates that trade union density is the only CB component with an acceptable signal-to-noise ratio (i.e. the within-country variation is greater than the residual variation; Swann, 2006) and, therefore, the only CB component for which the use of the 2FE estimator is appropriate.<sup>36</sup> On the basis of these results, we, therefore, decided to estimate equation (2) including all four components of CB (to avoid an omitted variable bias), but to exclusively focus on and interpret the regression coefficient associated with trade union density. As we saw in Subsection 4.1 that trade union density appears to be a key variable (along with the bargaining coverage rate and the level of centralisation) in explaining the long-run relationship between CB systems and working-age poverty (*after* taxes and transfers), we were thus able to extend our analysis further by testing the robustness of this significant finding with a 2FE estimator.

Our results on the relationship between trade union density and the four variables of interest, while controlling for country-level unobserved heterogeneity, common time shocks among countries and relevant covariates, are presented in Table 6. Our 2FE estimates first show that a 10 percentage point increase in union density is associated with a decrease in the incidence of low pay by 0.87 percentage points on average (see column (1)). Results further show (in column (2)) that unionisation rates are positively correlated with working-age poverty in a pre-tax benefit scenario. More precisely, a 10 percentage points increase in union density is associated with an increase in working-age poverty *before* taxes and transfers of 0.66 percentage points on average. This finding is probably related to the compression of the earnings distribution by trade unions (OECD, 2018), especially at the bottom end of the distribution. In other words, the point is that the lower incidence of low wages resulting from greater unionisation (see column (1)), is likely to shift the poverty line upward, resulting in a greater proportion of people with an equivalised market income below this poverty threshold. A related argument is that by raising wages above the competitive level, trade unions could negatively impact employment (Aidt and Tzannatos, 2008; Chang and Hung, 2016) and thus increase the pre-tax and transfer poverty

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<sup>36</sup> The detailed results of the ANOVA analyses and corresponding signal-to-noise ratios are available on request.

rate. However, caution is needed as the relationship between trade union density and employment is, as Garnero (2021: 1) points out, “more nuanced than previously suggested”.

Our results, in a post-tax and benefit scenario, are radically different. Indeed, the 2FE estimates presented in column (3) show that working-age poverty *after* taxes and transfers decreases on average by 0.62 percentage points when trade union density increases by 10 percentage points. The reversal of our findings *before* and *after* taxes and transfers is best understood by examining the estimation results presented in column (4). Indeed, they show that public social expenditure increases on average by 0.96 percentage points when trade union density increases by 10 percentage points.

**Table 6. Two-way fixed effects estimator: trade union density and poverty**

Dependent variable:	The incidence of low pay	Working-age poverty rate <i>before</i> taxes and transfers	Working-age poverty rate <i>after</i> taxes and transfers	Public social spending as a % of GDP
	(1)	(2)	(3)	(4)
Trade union density	-0.087** (0.044)	0.066*** (0.025)	-0.062*** (0.015)	0.096*** (0.019)
<b>Estimator</b>	<b>2FE</b>	<b>2FE</b>	<b>2FE</b>	<b>2FE</b>
Other collective bargaining components <sup>a</sup>	Yes	Yes	Yes	Yes
<u>Control variables<sup>b</sup></u>				
Demographics	Yes	Yes	Yes	Yes
Labour market characteristics	Yes	Yes	Yes	Yes
Macroeconomic performance	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects <sup>c</sup>	Yes	Yes	Yes	Yes
Observations	371	487	505	624
Panel of countries	24 <sup>d</sup>	24	24	24
Within R-squared	0.21	0.57	0.68	0.76

*Notes:* \*\*\*/\*\*/\* significant at the 1, 5 and 10% level. Within standard errors are reported in parentheses. <sup>a</sup> Collective bargaining components showing little within country-variation (i.e. bargaining centralisation, wage coordination, and bargaining coverage) have been included as covariates. Corresponding regression coefficients are not reported in this table as their signal-to-noise ratio is too small to enable statistical inference. <sup>b</sup> Demographics: educational attainment, youth population and children in households where the sole parent is not in employment. Labour market characteristics: inactivity rate, labour productivity growth and unemployment rate. Macroeconomic indicators: inflation, output gap, short-run interest rate and terms of trade. <sup>c</sup> 25 year dummies. <sup>d</sup> The following countries only show three available observations for the incidence of low pay: France, Norway, and Sweden. Source: OECD, ILO, LIS, Eurostat and OECD/AIAS ICTWSS databases, 1990-2015.

**Table 7. Two-way fixed effects estimator: trade union density and different components of public social spending**

Dependent variable: Public social spending as a % of GDP on	ALMP	Family	Health	Housing	Incapacity-related benefits	Old age	Survivors	Unemployment	Other social policy areas
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Trade union density	0.019*** (0.003)	-0.004 (0.009)	0.013** (0.005)	0.019*** (0.004)	0.005** (0.002)	-0.003 (0.010)	0.016*** (0.003)	0.024*** (0.004)	0.007*** (0.002)
<b>Estimator</b>	<b>2FE</b>	<b>2FE</b>	<b>2FE</b>	<b>2FE</b>	<b>2FE</b>	<b>2FE</b>	<b>2FE</b>	<b>2FE</b>	<b>2FE</b>
Other collective bargaining components <sup>a</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<u>Control variables<sup>b</sup></u>									
Demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Labour market characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic performance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects <sup>c</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	624	624	624	624	589	624	624	618	624
Panel of countries	24	24	24	24	24	24	24	24	24
Within R-squared	0.33	0.58	0.24	0.54	0.32	0.66	0.50	0.64	0.26

Notes: \*\*\*/\*\*/\* significant at the 1, 5 and 10% level. Within standard errors are reported in parentheses. The definitions of the nine social branches are presented in Table 3. The decomposition of public social spending by social branch as a percentage of GDP is provided in Appendix 3. <sup>a</sup> Collective bargaining components showing little within country-variation (i.e. bargaining centralisation, wage coordination, and bargaining coverage) have been included as covariates. Corresponding regression coefficients are not reported in this table as their signal-to-noise ratio is too small to enable statistical inference. <sup>b</sup> Demographics: educational attainment, youth population and children in households where the sole parent is not in employment. Labour market characteristics: inactivity rate, labour productivity growth and unemployment rate. Macroeconomic indicators: inflation, output gap, short-run interest rate and terms of trade. <sup>c</sup> 25 year dummies. Source: OECD, ILO, LIS, Eurostat and OECD/AIAS ICTWSS databases, 1990-2015.

So far, a positive relationship has been established between union density and the size of the welfare state. However, since our welfare state indicator is the sum of expenditures associated with nine social branches (see Table 3), in order to obtain more precise results on the channels through which unions can influence the poverty rate of the working-age population *after* taxes and transfers, equation (2) has been re-estimated using each type of social expenditure separately as a dependent variable. The corresponding 2FE estimates, presented in Table 7, show that unionization is significantly and positively associated with 7 out of the 9 social expenditure branches (i.e. active labour market programmes (ALMP), health, housing, incapacity-related benefits, survivors, unemployment and other social policy areas). On average, these seven categories account for 39.4 per cent of total public social spending and 8.1 per cent of the GDP in our panel of countries (see Appendix 3).

In section 2, we documented the significant participation of unions in the policymaking process of social security systems and even their involvement in the management of unemployment funds in some countries (i.e. the Ghent system). Our results back up these observations. More precisely, in line with earlier studies (Engler and Voigt, 2023; Jensen, 2012; Rueda, 2006), they provide empirical support for the existence of a positive relationship between union density and labour market-related welfare programs (i.e., ALMP, disability benefits and unemployment). Regarding other types of social expenditures (e.g. health, housing, survivors and other social policy areas), our results also suggest that unions play a significant role. This could notably be explained by unions' political strength in mobilizing workers to vote for political parties with a benevolent social agenda (Brady et al., 2016; Crouch, 2017; Korpi, 2006; Rudra, 2002; Sen, 2012).

The results presented so far, based on a 2FE estimator with a wide range of covariates, provide fairly consistent estimates of the relationship between union density, social spending and working-age poverty rates before and after taxes and transfers. However, caution is required as the quality of our estimates may still be affected by potential endogeneity issues and problems related to heterogeneous sample sizes. Therefore, in the next Subsection, we provide two sensitivity analyses to test the robustness of our 2FE estimates.

**Table 8. Sensitivity analysis: two-way fixed effects with instrumental variables**

Dependent variable:	The incidence of low pay	Working-age poverty rate before taxes and transfers	Working-age poverty rate after taxes and transfers	Public social spending as a % of GDP
	(1)	(2)	(3)	(4)
Trade union density	-0.077 (0.057)	0.051 (0.034)	-0.049** (0.020)	0.077*** (0.024)
<b>Estimator</b>	<b>2FE-2SLS</b>	<b>2FE-2SLS</b>	<b>2FE-2SLS</b>	<b>2FE-2SLS</b>
Other collective bargaining components <sup>a</sup>	Yes	Yes	Yes	Yes
<u>Control variables<sup>b</sup></u>				
Demographics	Yes	Yes	Yes	Yes
Labour market characteristics	Yes	Yes	Yes	Yes
Macroeconomic performance	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects <sup>c</sup>	Yes	Yes	Yes	Yes
Observations	367	477	495	600
Panel of countries	24 <sup>d</sup>	24	24	24
Within R-squared	0.21	0.57	0.67	0.75
<u>Diagnosis tests</u>				
Weak identification test <sup>e</sup> :				
<i>Cragg-Donald Wald F statistic</i>	1125.02	1667.38	1711.28	2391.29
Overidentification test <sup>f</sup> :				
<i>p-value of Sargan-Hansen J statistic</i>	0.00	0.00	0.88	0.52
Endogeneity test <sup>g</sup> :				
<i>p-value associated with Chi-squared statistic</i>	0.14	0.88	0.00	0.00

Notes: \*\*\*/\*\*/\* significant at the 1, 5 and 10% level. Within standard errors, calculated by creating 1000 bootstrap samples, are reported in parentheses. <sup>a</sup> Collective bargaining components showing little within country-variation (i.e. bargaining centralisation, wage coordination, and bargaining coverage) have been included as covariates. Corresponding regression coefficients are not reported in this table as their signal-to-noise ratio is too small to enable statistical inference. <sup>b</sup> Demographics: educational attainment, youth population and children in households where the sole parent is not in employment. Labour market characteristics: inactivity rate, labour productivity growth and unemployment rate. Macroeconomic indicators: inflation, output gap, short-run interest rate and terms of trade. <sup>c</sup> 25 year dummies. <sup>d</sup> The following countries only show three available observations for the incidence of low pay: France, Norway and Sweden. <sup>e</sup> The Cragg-Donald Wald F-statistic for weak identification is a Wald F statistic testing whether the excluded instruments are sufficiently correlated with the endogenous regressor. The null hypothesis is that the instruments are weak. According to the standard 'rule of thumb', weak identification is problematic for F statistics smaller than 10 (as suggested by van Ours and Stoeldraijer (2011)). <sup>f</sup> The Sargan-Hansen J statistic tests the null hypothesis that the instruments are valid, i.e. uncorrelated with the error term. Under the null hypothesis, the instruments are considered to be valid. <sup>g</sup> The Durbin-Wu-Hausman endogeneity test is based on the difference of two Sargan-Hansen statistics: one for the equation in which trade union density is treated as endogenous and one in which it is treated as exogenous. If the null hypothesis of this test cannot be rejected, then instrumentation is actually not necessary, i.e. union density can actually be considered as exogenous. Source: OECD, ILO, LIS, Eurostat and OECD/AIAS ICTWSS databases, 1990-2015.

### 4.3. Sensitivity analysis

Endogeneity may notably arise because of reverse causality, i.e. the fact that the incidence of low pay, working-age poverty rates and public social spending may themselves influence trade

union density. To address this issue, we applied a two-way fixed effects two-stage least squares (2FE-2SLS) estimator. In order to find appropriate instruments, i.e. variables that are correlated with trade union density but not with our four dependent variables, we drew on existing studies. Following common practice (e.g. Piton and Rycx, 2019; Reed, 2015), our first instrument is simply the lagged value of trade union density. Our second instrument, inspired by Giuliano et al. (2013),<sup>37</sup> is the lagged value of average trade union density in neighbouring countries.<sup>38</sup> The assumption underlying the choice of our second instrument is that the average lagged level of trade union density in neighbouring countries is likely to have a significant impact on the contemporaneous value of trade union density in the country in question but not on its current level of low pay, working-age poverty and public social spending.

To assess the soundness of our 2FE-2SLS approach, we performed an array of diagnostic tests. The results of these tests are reported at the bottom of Table 8 (see also Appendix 5 for first-stage estimates). The Cragg Donald Wald  $F$  statistics suggest that our IVs are not weak, which is also supported by first-stage estimates.<sup>39</sup> As regards the Durbin-Wu-Hausman endogeneity test<sup>40</sup>, the  $p$ -values associated with the Chi-squared statistics are equal to 0.14, 0.88, 0.00 and 0.00 in columns (1) to (4), respectively. These results suggest that the null hypothesis of no endogeneity should be rejected in columns (3) and (4) but not in columns (1) and (2). In other words, they suggest that our main explanatory variable, i.e. trade union density, is not endogenous when looking at the impact on low pay incidence and working-age poverty *before* taxes and transfers. Consequently, 2FE estimates (reported in Table 6) should be preferred to those obtained by 2FE-2SLS in these cases.<sup>41</sup> Therefore, our findings remain unchanged from those discussed in the previous subsection, namely that the unionization rate is significantly and negatively (positively) correlated with the incidence of low-wage employment (the working-age poverty rate *before* taxes and transfers).

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<sup>37</sup> Giuliano et al. (2013) use the average level of democracy in neighbouring countries as an instrument to tackle the reverse causality between economic reforms and democracy.

<sup>38</sup> We define neighbouring countries as those countries (excluding overseas territories) that share a common land or maritime border. We used the United Nations Convention on the Law of the Sea to identify maritime borders.

<sup>39</sup> As suggested by van Ours and Stoeldraijer (2011), we rely on the standard “rule of thumb” that weak identification is problematic for  $F$  statistics smaller than 10.

<sup>40</sup> The Durbin-Wu-Hausman test is based on the difference between two Sargan-Hansen statistics: one for the equation in which trade union density is treated as endogenous and one for the equation in which it is treated as exogenous. If the null hypothesis of this test cannot be rejected, then instrumentation is actually not necessary, implying that 2FE estimates should be preferred to those obtained with the 2FE-2SLS estimator.

<sup>41</sup> 2FE-2SLS standard errors may not be correctly measured as their corresponding estimates in the second stage are obtained from estimated regressors. Therefore, we generated 1,000 bootstrap samples to increase the inference power of our 2FE-2SLS estimates without making strong distributional assumptions (Wilcox, 2010). Bootstrapped standard errors are reported between parentheses in Table 8.

In contrast, the results of the Durbin-Wu-Hausman test indicate that union density is endogenous when using either working-age poverty *after* taxes and transfers or public social spending as the dependent variable. In these two cases, our instrumentation strategy is thus warranted, so that 2FE-2SLS estimates should be preferred to those obtained by 2FE. Concerning the quality of our instruments, we further find that the  $p$ -values associated with the Sargan-Hansen's  $J$  overidentification test are equal to 0.88 and 0.52, respectively, in the regressions using working-age poverty *after* taxes and transfers and social spending as dependent variables (see columns (3) and (4) of Table 8). This suggests that our instruments are valid. Regarding the regression coefficients themselves, they show that working-age poverty *after* taxes and transfers decreases on average by 0.49 percentage points when trade union density increases by 10 percentage points. The inversion of our results *before* and *after* taxes and transfers can again be understood by the relationship between unions and the welfare state. The 2FE-2SLS estimates, presented in column (4) of Table 8, suggest indeed that a 10 percentage point increase in union density is associated, on average, with a 0.77 percentage point increase in public social spending.

Overall, this first robustness test corroborates our benchmark estimates. However, 2FE-2SLS estimates should be interpreted with caution. Indeed, it remains very difficult to find valid instruments, namely variables that are both relevant (i.e. goods predictors of the trade union density) and exogenous (i.e. uncorrelated with the dependent variables). Accordingly, while 2FE-2SLS estimates presented in this Subsection strongly support the existence of a significant influence of union density on social spending and working-age poverty *after* taxes and transfers, they should not be interpreted as causal.

Beyond endogeneity issues, sample size effects might also drive our 2FE estimates since the number of observations in our panel varies according to the dependent variable that is considered. In order to evaluate these sampling concerns, we re-estimated equation (2) using a perfectly overlapping sample (i.e. the same sample for all regressions). Table 9 presents corresponding 2FE estimates.<sup>42</sup> The number of observations in our overlapping sample

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<sup>42</sup> It should be noted that in this robustness check, the specification for the incidence of low pay has not been considered, given that this outcome only contains three observations for France, Norway and Sweden before 2015, as well as very unbalanced data for other countries (e.g. Ireland, Iceland, the Netherlands, Spain and Switzerland). However, as our main objective is to test the robustness of the association between trade union density, poverty and social expenditures, this is unlikely to affect our conclusions.

corresponds to the one we had so far when using as a dependent variable the working-age poverty rate *before* taxes and transfers. Accordingly, estimates in column (1) of Table 9 are the same as those reported in column (2) of Table 6. They thus show a significantly positive association between union density and poverty *before* taxes and transfers. As regards the relation between union density and poverty *after* taxes and transfers, we find very little difference with respect to our benchmark specification. Indeed, the coefficient of union density is statistically significant and equal to -0.61 (instead of -0.062 in column (3) of Table 6). Finally, our robustness test corroborates previous results concerning the nexus between union density and social expenditure. The regression coefficient associated with union density (see column (3) of Table 9) is still significantly positive and even bigger.<sup>43</sup>

**Table 9. Sensitivity analysis: two-way fixed effects with overlapping samples**

Dependent variable:	Working-age poverty rate <i>before</i> taxes and transfers	Working-age poverty rate <i>after</i> taxes and transfers	Public social spending as a % of GDP
	(1)	(2)	(3)
Trade union density	0.066*** (0.025)	-0.061*** (0.015)	0.182*** (0.022)
<b>Estimator</b>	<b>2FE</b>	<b>2FE</b>	<b>2FE</b>
Other collective bargaining components <sup>a</sup>	Yes	Yes	Yes
<u>Control variables<sup>b</sup></u>			
Demographics	Yes	Yes	Yes
Labour market characteristics	Yes	Yes	Yes
Macroeconomic performance	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Year fixed effects <sup>c</sup>	Yes	Yes	Yes
Observations	487	487	487
Panel of countries	24	24	24
Within R-squared	0.57	0.66	0.73

*Notes:* \*\*\*/\*\*/\* significant at the 1, 5 and 10% level. Within standard errors are reported in parentheses. <sup>a</sup> Collective bargaining components showing little within country-variation (i.e. bargaining centralisation, wage coordination, and bargaining coverage) have been included as covariates. Corresponding regression coefficients are not reported in this table as their signal-to-noise ratio is too small to enable statistical inference. <sup>b</sup> Demographics: educational attainment, youth population and children in households where the sole parent is not in employment. Labour market characteristics: inactivity rate, labour productivity growth and unemployment rate. Macroeconomic indicators: inflation, output gap, short-run interest rate and terms of trade. <sup>c</sup> 25 year dummies. Source: OECD, ILO, LIS and OECD/AIAS ICTWSS databases, 1990-2015.

<sup>43</sup> This is likely due to the fact that observations that have been excluded for this robustness test mainly belong to countries in which social spending and union density did not follow the same pattern over the observation period (e.g. Australia, Austria, Korea and Portugal).

Overall, estimates based on overlapping samples thus tend to back up our main conclusions. On the one hand, they do not support the hypothesis that trade unions reduce working-age poverty in a post-tax benefit scenario through a direct effect on the earnings distribution. On the other, they do suggest that higher trade union density leads to a lower working-age poverty rate *after* taxes and transfers and that this impact stems from the influence of unions on public social spending.

## 5. Conclusion

Over the past four decades, inequality and poverty have soared throughout the developed world (Atkinson and Piketty, 2007; OECD, 2015; Piketty, 2013). At the same time, collective bargaining (CB) systems have undergone a continuous process of dismantling and weakening, particularly in English-speaking and Southern European countries (Dustmann et al., 2014; Gray, 2009; OECDa, 2017; OECD, 2018; Payá Castiblanque, 2020; Visser, 2016). Although the influence of CB systems on wage inequality has been widely studied, to our knowledge, only six studies have examined the impact of these systems on poverty, and only four of these from a cross-country perspective (Brady, 2003; Brady, 2009; Brady et al., 2013; Lohmann, 2009; Plasman and Rycx, 2001; VanHeuvelen and Brady, 2022). Yet, it would be a mistake to believe that the relationship between CB systems and poverty necessarily matches the one estimated with wage inequality. Indeed, whereas wage inequality is measured at the individual level, poverty *before* (*after*) taxes and transfers is calculated at the household level using equivalised market (disposable) incomes (Lohmann and Marx, 2018; McKnight et al., 2016). In addition, CB systems can provide an institutional environment conducive to political action by trade unions and, in particular, to their influence on public social spending (Ahlquist, 2017; Engler and Voigt, 2023; Faniel, 2018; Peña-Casas and Ghailani, 2019; Pontulson, 2013) and therefore also on poverty rates *after* taxes and transfers.

Further research is therefore much needed to better understand the relationship between CB systems and poverty. This is especially true as all cross-national studies on this issue rely on rather old, often unbalanced datasets over short periods. Moreover, to our knowledge, no cross-national study has so far accurately controlled for country-level, time-invariant unobserved heterogeneity (i.e. country fixed effects) and potential endogeneity issues (which may notably result from reverse causality). Our paper, therefore, makes a significant contribution to this literature by drawing on macro-level data over the period 1990-2015 for 24 developed countries

to provide new, more solid econometric evidence (controlling, *inter alia*, for country and year fixed effects and providing sensitivity tests for endogeneity and overlapping samples) on how the main characteristics of CB systems (e.g. bargaining coverage, trade union density, wage coordination and bargaining centralisation) shape low pay incidence, working-age poverty rates in pre- and post-tax benefit scenarios and public social expenditure from a cross-country perspective.

Using a pooled OLS estimator with time fixed effects and a wide range of covariates, we first find that countries with a higher bargaining coverage (i.e. a more centralised bargaining system) or trade union density have a significantly lower incidence of low pay. Nonetheless, this wage compression effect is not mirrored in the bottom part of the market income household distribution. Indeed, none of the four CB components under investigation is found to be significantly and negatively correlated with working-age poverty *before* taxes and transfers. This result is consistent with studies showing that increases in the minimum wage (a key feature of CB systems in many countries) lead to little improvement in the incomes of the bottom quintile, since most low-wage workers are in households with incomes around the middle quintile (Logue and Callan, 2016; Overstreet, 2021; Sabia and Burkhauser, 2010; Sabia, 2014). It should be noted, however, that a pre-tax benefit scenario represents a ‘simulation’ (i.e. an artificial situation), as no one lives in such a world. Moreover, it is based on the strong assumption that the labour supply would not be responsive to taxes and transfers. In a post-tax benefit scenario, our results are quite different. Indeed, working-age poverty rates *after* taxes and transfers are found to be significantly lower in countries with a higher proportion of workers covered by collective agreements (i.e. a more centralised bargaining system) or affiliated with a trade union. These results are consistent with previous cross-country studies on this issue (Brady, 2003; Brady, 2009; Lohmann, 2009; Plasman and Rycx, 2001).

Next, turning to within-country variations (i.e. short-run dynamics), our two-way fixed effects (2FE) estimates suggest that the negative cross-country relationship between CB components and poverty *after* taxes and transfers stems from the political strength of trade unions in promoting public social spending (e.g. active labour market policies, health, housing, and incapacity-related and unemployment benefits) rather than from any direct effect on earnings inequalities. It should be noted that our analysis of the association between trade union density, working-age poverty rates and public social spending econometrically holds across different sensitivity tests such as two-way fixed effects two-stage least square (2FE-2SLS) regressions

and estimations using overlapping samples. Moreover, our 2FE estimates confirm earlier cross-country studies that empirically link trade unions to redistribution (Bradley et al., 2001; Iversen and Soskice, 2006; Plasman and Rycx, 2001; Pontusson, 2013; Swank, 2020).

From a theoretical perspective, our findings align with the power resource approach, which explains that unions are not only involved in negotiating better wages and working conditions but can also be driving political forces in the success of welfare states. In other words, they seem compatible with the argument that unions mobilise workers to vote for political parties that, in turn, implement redistributive policies and lobby for legislation that increases social benefits, especially for the working class and the poor (Brady et al., 2016; Crouch, 2017; Engeman, 2021; Korpi, 2006; Rudra, 2002; Sen, 2012). Our results are also consistent with the social-democratic corporatist model, which emphasizes union involvement in governance bodies (e.g. social security institutions) to promote social spending and redistributive policies (Afonso, 2013; Janoski and Hicks, 1994; Lane and Ersson, 2004). In this regard, it is worth noting that in order to demonstrate significant political power, unions appear to need a relatively centralised CB system (i.e. broad bargaining coverage) and/or to have a sufficiently large membership, which, in turn, allows the presence of a complex institutional environment with consultation systems and social dialogue bodies (Ahlquist 2017; Faniel 2018; Peña-Casas and Ghailani, 2019; Pontusson 2013). Our results suggest indeed that these features of CB systems go hand in hand with an elaborate institutional and policy framework that strengthens social policies for groups at risk of poverty.

To sum up, our study provides up-to-date and solid empirical evidence on the social impact of CB systems across 24 developed countries, highlighting the role of trade unions in reducing poverty among the working-age population through the welfare state (i.e. by pushing governments to spend more on social security) rather than through a direct effect on wage formation. These results appear consistent with the conclusion of Brady et al. (2010) that the role of the welfare state in reducing poverty is at least as important as labour market policies or reforms aimed at achieving this goal.

## Chapter 2

# Moving up the social ladder? Wages of first- and second-generation immigrants from developing countries<sup>44</sup>

### Abstract

Using matched employer-employee data for Belgium, covering 1.3 million workers over almost two decades, we find that first-generation immigrants born in developing countries and their second-generation peers receive significantly lower wages than workers born in developed countries (i.e. evidence of persistent wage penalty across two generations). However, controlling for a large set of covariates (including firm fixed effects), our estimates suggest that while first-generation immigrants still experience a significant adjusted wage gap, there is no evidence of such a gap for their second-generation peers. Moreover, reweighted, recentered influence function Oaxaca-Blinder decompositions show that first-generation immigrants receive lower wages due to their lower levels of human capital, segregation in low-paying occupations and sectors, and an unexplained component (e.g. wage discrimination). In contrast, second-generation immigrants earn less, mainly because they are younger and have fewer years of tenure. Finally, moderators for geographical origin, gender and position in the wage distribution refine these findings.

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<sup>44</sup> Chapter 2, co-authored with Rycx F. and Volral. M, is under review in an international peer-reviewed journal. The data used in this paper are available from Statistics Belgium. However, restrictions may apply to the availability of these data, as confidentiality agreements and licenses must be signed with Statistics Belgium. The STATA do-files supporting this paper's findings are available on request.

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## 1. Introduction

One of the mainstays of poverty and inequality disparities is the intergenerational transmission of socioeconomic status from parents to children, which is particularly strong among high-educated natives and low-educated immigrants (Bloome et al., 2018; Ryabov, 2020; Sharkey, 2008).<sup>45</sup> Focusing on the immigrant population, Card (2005) points out that since the descendants of immigrants are born, educated and socialised in the host country, their relative success or failure is often considered the ultimate benchmark for integration. In this respect, Duncan and Trejo (2015) state that the ultimate indicator of labour market integration for immigrants and their children may be wages, as they reflect the market's final valuation of a worker, which encompasses individual characteristics such as age, gender, education, abilities, family background and social capital. Therefore, in light of these premises, Belgium offers an interesting case study to investigate the legacy of immigration in the labour market through the lens of wages, as people of foreign origin represented 31.1% of the total population aged 18-64 in 2016, of which 14.2% are first-generation (F-G) immigrants and 16.9% are second-generation (S-G) immigrants (FPS Employment and Unia, 2019).<sup>46</sup>

In the developed world, the empirical literature on the intergenerational evolution of immigrants' wages has considerably broadened in recent decades (e.g. Aydemir et al., 2009; Borjas, 1994; Card, 2005; Flake, 2013; Melzer et al., 2018; van Ours and Veenman, 2004). Nonetheless, several studies consider immigrants as a homogenous group of origin, which may mask specific features related to their country of birth or that of their parents (e.g. economic conditions, quality of the education system and reasons for migration), which in turn may influence their labour market outcomes (Fleischmann and Dronkers, 2010). In a similar vein, the labour market integration of immigrants across generations is likely to be influenced by source-country characteristics such as patronymic, physical appearance, religion and cultural customs (Levels and Dronkers, 2008).

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<sup>45</sup> Unless mentioned otherwise, we use the words i) 'first-generation immigrants' and 'foreign-born people' for people born abroad; ii) 'second-generation immigrants', 'children of immigrants' and 'descendants of immigrants' for people born in the host country with at least one foreign-born parent; iii) 'immigrants' for first- and second-generation immigrants, and iii) 'natives' for people born in the host country with both parents born in the host country.

<sup>46</sup> FPS Employment and Unia (2019) define people of foreign origin according to their nationality and that of their parents. The 31.1% of the population of foreign origin aged 18-64 in Belgium can be broken down as follows: 13.2% from EU-14, 3.0% from EU-13, 2.3% from EU candidates, 1.5% from other European countries, 5.0% from the Maghreb, 2.4% from other African countries, 0.8% from the Near and Middle East, 1.7% from Asian countries and Oceania, 0.2% from North America, 0.6% from Central and South America and 0.3% of unknown origin.

Following these statements, a limited yet growing number of studies classifying immigrants by origin shows that in Europe and North America, S-G immigrants from developed countries perform similarly to natives in terms of wages. In contrast, they still find evidence of a significant wage gap between natives and S-G immigrants from transition and developing countries (i.e. Africa, non-EU Eastern Europe, the Maghreb, the Near and Middle East, and Latin America) (e.g. Abramitzky et al., 2021; Athari et al., 2019; Dustmann et al., 2011). However, it should be noted that most of the existing literature must be interpreted with caution because of significant methodological and/or data limitations, such as: i) small samples or short time spans under study, ii) a restricted number of control variables (i.e. scarce or no information on the characteristics of workers' jobs and workplaces), iii) incomplete framework (i.e. no F-G immigrants in the sample), and iv) standard OLS regressions, computed at the mean, which are likely to be affected by outliers and vary significantly along the wage distribution.

Moreover, it should be noted that the intergenerational relationship between origin and wages is likely to be moderated by workers' gender. Indeed, the labour market aspirations of female immigrants are likely to be strongly shaped by the traditional values, gender stereotypes and cultural habits that exist in their country of birth or that of their parents (Blau et al., 2013; Kulu et al., 2015). Similarly, OECD (2020a) highlights the role of work-life balance (i.e. working while being involved in childcare and household tasks) in explaining different labour market trajectories between female and male immigrants. In accordance with these statements, some studies find that immigrant-native wage gaps across generations differ significantly by gender (e.g. Algan et al., 2010; Duncan and Tejo, 2018; Sakamoto et al., 2010). However, it is worth noting that all those existing studies estimate regressions separately for female and male workers (i.e. they include no interaction effects between origin and gender), which prevents them from providing clear evidence on the separate contribution of gender and immigration background to potential double immigrant-native wage penalties.

Regarding the wages of immigrants across generations, it is also essential to take into account workers' position in the wage distribution. Indeed, although the standard approach is to estimate exclusively immigrant-native wage gaps at the mean, these can only be taken as a representative picture of the group of interest if the underlying data-generating process is homoscedastic (i.e. estimates are not reversed or do not diverge substantially along the wage distribution). Moreover, previous studies also encourage the estimation of unconditional quantile regressions in intergenerational studies because they show that F-G immigrant-native wage gaps expand

along the wage distribution and identify a heterogeneous contribution of observable characteristics (e.g. age, experience, education and occupation) to these gaps (e.g. Hofer et al., 2017; Ingwersen and Thomsen, 2021; Lehmer and Ludsteck, 2011).

However, as far as we know, only one study has investigated the wages of S-G immigrants beyond the mean (Athari et al., 2019 for France). Using unconditional quantile regressions, the authors show that the overall wage gaps for S-G immigrants from the Maghreb and Turkey (Sub-Saharan Africa and Southern Asia) increase (remain somewhat constant) along the wage distribution. Athari et al. (2019) also point out that across quantiles, the overall wage gaps for S-G immigrants from Turkey and Southern Asia are wholly explained by worker and employment characteristics (i.e. quantity effects). In contrast, adjusted wage gaps (i.e. price effects) are only observed for S-G immigrants from the Maghreb and Sub-Saharan Africa. However, the authors do not comprehensively discuss how observable characteristics shape these gaps, leaving unexplored the role of composition effects (e.g. do immigrants receive lower wages because they are segregated in low-paying occupations?). Last but not least, it should be noted that migration flows to Western Europe at the end of the 20<sup>th</sup> century have been mainly characterized by the arrival of low-educated immigrants (Schoonvaere, 2013). Therefore, if S-G immigrants succeeded in earning more than their F-G peers and, potentially, in closing the gap with natives, it is of particular interest to investigate whether this occurs all along the wage distribution.

Before delving into the details of our work, we describe other features of the country under study that also motivate this research. First, Belgium is one of the worst OECD economies in terms of F-G immigrants' access to the labour market (Pina et al., 2015; OECD, 2020a).<sup>47</sup> Nonetheless, employment outcomes differ considerably according to geographical origin in Belgium. For instance, only 46% of the working-age population born in non-EU (i.e. non-European Union) countries had a job in 2017, while the employment rate of EU-born people (68.3%) was much closer to that of natives (73.7%) (OECD/EU 2018). This issue also extends to the descendants of non-EU immigrants, whose employment rate amounted to 53.4% in 2017 (Eurostat, 2023b). In addition, a robust body of empirical literature accords with these figures, stating that the employment outcomes of S-G immigrants from transition and developing countries (i.e. non-EU origin) are hardly any better than those of their F-G counterparts, i.e. that

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<sup>47</sup> Only Greece, Mexico and Turkey show lower employment rates for F-G immigrants in the OECD area.

they are far worse than those of Belgian natives (e.g. Corluy et al., 2015; De Cuyper et al., 2018; Heath and Cheung, 2007; Piton and Rycx, 2021). Nevertheless, to the best of our knowledge, once employment in Belgium is secured for people from transition and developing countries, the intergenerational evolution of their wages has never been empirically investigated.<sup>48</sup> Furthermore, any analysis of S-G immigrants from transition and developing countries in Belgium requires careful attention, as previous studies reveal the existence of poor earnings outcomes, a higher wage penalty associated with overeducation and wage discrimination for F-G immigrants born in transition and developing countries (e.g. Fays et al., 2021; Jacobs et al., 2021; Kampelmann and Rycx, 2016; Grinza et al., 2020; Vertommen and Martens, 2006).

We attempt to shed new light on the intergenerational interplay between origin and wages, placing our main emphasis on workers originating from developing countries.<sup>49</sup> In order to achieve this goal, we leverage a rich, matched employer-employee database of 1.3 million observations for the Belgian private sector. The richness of our database is that it provides cross-sectional information on a nationally representative sample of workers between 1999 and 2016. It also contains information on workers' country of birth and that of their parents, alongside a wide range of covariates (e.g. age, tenure, education, type of household, type of contract, occupation, working time, firm size, level of collective agreement and firm fixed effects), which makes it well suited for providing reliable empirical findings.<sup>50</sup>

It should be noted that we merge natives (i.e. workers born in Belgium with both parents born in Belgium) with immigrants from developed countries because previous studies show that the employment outcomes of these two groups of workers in Belgium are comparable across two generations (e.g. Corluy et al., 2015; Piton and Rycx, 2021). This is also corroborated by descriptive statistics and regression analyses based on our data. Indeed, Appendix 2 shows that: i) F-G immigrants born in developed countries receive similar wages as those of natives and S-

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<sup>48</sup> Only some descriptive statistics show that the incidence of low pay among immigrant workers of non-EU origin increases across two generations (Corluy et al., 2015).

<sup>49</sup> By 'developing countries', we mean either transition and developing countries listed in the United Nations' (2019) classification and/or emerging market and developing economies listed in the IMF's (2019) classification (see Appendix 1).

<sup>50</sup> Our empirical analysis is consistent with that used in the vast majority of existing (also more recent) studies documenting the intergenerational evolution of immigrant wages (e.g., Algan et al., 2010; Athari et al., 2019; Card et al., 2000; Duncan and Trejo, 2018; Gueye and Ceci-Renaud, 2022). Indeed, we identify F-G immigrants and their S-G counterparts on the basis of workers' country of birth and that of their parents. In other words, like most previous studies, our analysis does not focus on clearly identified parent-child pairs. To our knowledge, only four studies - three in Sweden and one in the United States - have used this 'paired approach' so far (see Table 1 for a review).

G immigrants from developed countries earn slightly less than natives (see column 1), and ii) controlling for observables (including firm fixed effects), there are no significant adjusted wage gaps between natives and immigrants from developed countries across two generations (see column 2).<sup>51</sup>

That having been said, we implement our empirical strategy as follows. First, using weighted multilevel log-linear regressions, we estimate the overall and adjusted wage gaps between workers born in developed countries with both parents born in developed countries and workers originating from developing countries across two generations. Second, using a more fine-grained classification of workers' country of birth and that of their parents, we explore the role of geographical origin (e.g. the Maghreb or Sub-Saharan Africa) in overall and adjusted wage gaps across two generations.<sup>52</sup> Third, we scrutinize the role of gender in overall and adjusted wage gaps across two generations by including in our econometric analysis interaction effects between origin and gender (rather than estimating separate regressions by gender as is done in the existing literature). Fourth, we use an advanced econometric methodology, the so-called reweighted, recentered influence function Oaxaca-Blinder (RIF-OB) decompositions (Firpo and Pinto, 2016; Firpo et al., 2018), in order to investigate: i) how the position in the wage distribution shapes overall wage gaps across two generations, ii) how worker, employment and firm characteristics contribute to these gaps across two generations (i.e. analysing the contribution of quantity and price effects in overall wage gaps), and iii) to provide a more fine-grained assessment of the role of gender along the wage distribution.

The body of our paper is organized as follows. In the next section, we discuss the relationship between origin and labour market integration from an intergenerational perspective and document previous intergenerational studies on the wages of immigrants from developing countries. We present our methodology in Section 3, while Section 4 describes the structure of our database. Section 5 discusses the findings of our weighted multilevel log-linear regressions and reweighted RIF-OB decompositions. Finally, Section 6 concludes.

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<sup>51</sup> This approach could be subject to some comment, as there could potentially be somewhat larger wage differentials between natives and immigrants from non-EU developed countries (e.g., Australia, Canada, New Zealand and the USA). However, it should be noted that as these immigrants represent less than 0.4% of our final sample, in any case, estimation bias can only be marginal and is, therefore, unlikely to affect our conclusions. Regression results, available on request, confirm this.

<sup>52</sup> For the sake of accuracy in correctly classifying immigrants by geographical origin and economic development level, we constructed our geographical classification of countries based on both the United Nations' (2019) classification and the IMF's (2019) classification (see Appendix 3).

## **2. Labour market integration of immigrants across generations**

Classic assimilation theory states that, since S-G immigrants are born, educated and socialised in the host country, their socioeconomic outcomes should be better than those of their F-G peers and eventually comparable to those of natives (Alba et al., 2011; Greenman and Xie, 2008; Park and Myers, 2010). Nevertheless, another strand of literature views this assumption as too optimistic and instead supports the segmented assimilation theory (Heath et al., 2008; Portes and Rumbaut, 2001; Rumbaut, 2005). The latter asserts that descendants of immigrants may still encounter low levels of social mobility (e.g. difficulties in entering the labour market or overconcentration in the least favourable segments of the labour market) and persistent integration problems (i.e. discrimination and marginalisation). This more pessimistic view is explained in particular by the parental transmission of cultural capital, social norms and physical characteristics, which can vary according to immigrants' geographical origin (Blau et al., 2013; Blau, 2015; Phalet and Heath, 2010). It should be noted, however, that although the segmented and classic assimilation theories diverge in insights, both have overlapping explanations for assessing the integration of immigrants across generations. Indeed, both theories highlight the influence of immigrant parents' backgrounds and preferences in shaping the level of failure or success of their descendants.

In this context, the worker characteristics of the foreign-born workforce (e.g. education, experience and training acquired in the country of origin) are often associated with poor labour market outcomes in the host country due to the imperfect international transferability of foreign human capital (i.e. a low valuation of pre-migration skills in the host country) (Basilio et al., 2017; Chiswick and Miller, 2009). However, this issue should, in principle, disappear for S-G immigrants, given that they possess human capital linked to the host country's labour market. In addition, several studies show that in EU countries, S-G immigrants exhibit, on average, higher levels of education than their F-G peers (e.g. Algan et al., 2010; Ekberg et al., 2010; Eurostat, 2023a; OECD, 2016). Therefore, since education in the host country is one of the drivers for boosting the opportunities of people of foreign origin to access the labour market and get well-paid jobs, this can be interpreted as a sign of upward mobility, in line with the classical assimilation theory.

Nevertheless, S-G immigrants' educational outcomes depend on their origin. Indeed, in 2014, at the EU level, the share of tertiary graduates of non-EU origin was more than two percentage

points lower than that of their counterparts of EU origin (Eurostat, 2023c). This achievement gap may result from additional barriers that S-G immigrants from developing countries face to accumulate host country education, as previously highlighted by the segmented assimilation theory. More precisely, F-G immigrants born in developing countries tend to be less educated, less proficient in the host country's language and less informed about how the school system works, which reduces the degree of support in their children's learning (FPS Employment and Unia, 2017; OECD, 2020b).

Along the same line, immigrant parents' attitudes in the home environment can slow or hinder their children's academic success. For instance, in 2018, on average across OECD countries, 62% of F-G immigrant students and 41% of S-G immigrant students did not speak the host country's language at home (OECD, 2020c). The COVID-19 crisis has also shown how fragile the education of children of immigrants can be. For example, the OECD (2020d) shows that children from immigrant households have seen their command of the host country's language decline as a result of studying at a distance (i.e. solely from home).

Moreover, the labour market performance of immigrants across generations is also influenced by pre-existing immigrant communities in the host country. In principle, immigrants can benefit from immigrant networks to foster their socioeconomic and residential mobility (i.e. the classical assimilation theory) (Lin et Zhou, 2005). Nonetheless, this positive role may be reversed over time and across generations in specific immigrant communities. Previous research actually shows that immigrant networks from developing countries tend to furnish limited, precarious job opportunities (Kalter and Logan, 2014; Kazemipur, 2006), thus delaying familiarity with the functioning of the primary labour market and strengthening earnings status-quo across generations (i.e. the segmented assimilation theory) (OECD, 2014).

In a similar vein, immigrant networks tend to trigger a pattern of strong concentration of immigrants in lower-graded or run-down neighbourhoods, which reinforces the overrepresentation of their children in disadvantaged schools and the parental transmission of poor labour market and socioeconomic outcomes (Pina et al., 2015; Ryabov, 2020; Zhou, 1997). In this regard, OECD (2021) further documents that S-G immigrants exhibit strong stability for living in immigrant-dense neighbourhoods from childhood to adulthood in Europe.

Regarding the interacting role of origin and gender, the segmented assimilation theory states that the parental transmission of the home country's cultural norms (i.e. fertility, gender norms and partnership choices) is likely to affect the labour market expectations of female immigrants from developing countries across generations (Blau et al., 2013; Kulu et al., 2015). More specifically, several studies find that S-G female immigrants who marry partners with similar ethnic characteristics present lower socioeconomic status and labour market outcomes than those who enter interethnic marriages (e.g. Flake, 2013; Meng and Gregory, 2005; Wiik and Bergsvik, 2022). In this regard, it is worth mentioning that ethnic marriages seem to be persistent in immigrant communities with non-white ethnicity (i.e. mainly communities from developing countries) (Dupont et al., 2017; Furtado and Theodoropoulos, 2011).

Moreover, earlier motherhood in the mother's home country is strongly correlated with earlier motherhood among S-G female immigrants, which has a long-lasting, negative effect on their wages and working hours in the host country (Noghanibehambari et al., 2022). Similarly, OECD (2020b) shows that female immigrants with a non-EU background in specific households (e.g. couples with children at home and single parents) face a substantial employment penalty because they are more involved in housework and motherhood than native mothers. A series of empirical studies go in the same direction, stating that even after controlling for observables, F-G and S-G female immigrants from developing countries still face a double employment penalty based on their gender and migration background (e.g. Athari et al., 2019; OECD, 2020a; Piton and Rycx, 2021).

Last but not least, ethnic discrimination can be an ultimate barrier to the labour market integration of immigrants across generations (i.e. the segmented-assimilation theory), which may occur through two main channels: i) employers make employment or wage-setting decisions based on ethnic preferences (i.e. taste-based discrimination); and ii) employers discriminate based on ethnic stereotypes due to incomplete information on immigrants' productivity and human capital (i.e. statistical discrimination) (Becker, 1957; Zschirnt and Ruedin, 2016).

Although there are solid grounds for establishing an intergenerational relationship between origin and labour market integration, especially for immigrants from developing countries, other external factors should also be considered in this relationship. Indeed, host country institutions, workplaces' environments, integration policies and social stratification can

mitigate or exacerbate immigrant-native labour market inequalities across generations (Crul et al., 2012). For example, in countries with high levels of inequality, there are few opportunities for upward mobility for F-G immigrants and their children situated at the bottom of the income distribution (Zhou, 1997). In workplaces with high wage inequalities, F-G immigrants and their descendants also experience more significant immigrant-native wage gaps (Melzer et al., 2018). By contrast, anti-discrimination policies and wage subsidies are linked to a better labour market integration of immigrants (Butschek and Walter, 2014; Platt et al., 2022). Active labour market policies also reduce the share of immigrants in low-skilled and temporary jobs (Guzi et al., 2021). Similarly, firm-level and industry-wide collective wage agreements seem to attenuate immigrant-native wage gaps (Kampelmann and Rycx, 2016; Melzer et al., 2018).

As far as intergenerational analysis of the wages of immigrants is concerned, although the first studies date back to the 1990s, the empirical literature on this key issue is far less abundant than that on access to employment (e.g. Belzil and Poinas, 2010; Midtbøen, 2016; OECD, 2020a; Piton and Rycx, 2021). However, getting a job is only the first step to success in the job market, and any intergenerational improvement in access to employment may mask persistent wage inequalities between natives and people of foreign origin. To our knowledge, the intergenerational evolution of wages by origin, with a particular focus on immigrants from developing countries, has so far been studied in only six developed countries (i.e. France, Germany, the Netherlands, Sweden, the United Kingdom and the United States).<sup>53</sup>

Table 1 presents a comprehensive list of previous studies, their data, methodology and main findings. We always refer to the adjusted immigrant-native wage gap (i.e. the wage gap while controlling for covariates) when documenting the results of previous research. Nevertheless, it should be noted that the number of covariates considerably differs according to the study (see Table 1 for a list of covariates included in each study).

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<sup>53</sup> In Switzerland, Maskileyson et al. (2021) conduct an intergenerational study on immigrants' income. However, strictly speaking, we cannot consider that to be a study on the wages of F-G and S-G immigrants because its main variable of interest is 'personal net monthly income', which includes more than wages (i.e. pay leave, interests, and dividends) and represents workers' disposable income (i.e. the income after deduction of compulsory social insurance contributions and pension fund contributions, plus or minus any alimony (maintenance) payments).

**Table 1: Previous intergenerational studies on the wages of immigrants from developing countries**

Authors	Country	Data (1) / Time span (2) / Methodology (3)	Covariates	Main findings
<i>First generation vs. Second generation vs. Natives</i>				
Abramitzky et al. (2021)	United States	(1) Cross-sectional sample and father-child linkage: * (2) 1880, 1910, 1940, 1994-2000, 2006-2015 (3) OLS regressions	Parent's age, son's age, and gender	The earnings gaps for S-G immigrants are substantially smaller than those for their F-G peers, except for immigrants from Latin America and the Caribbean.
Algan et al. (2010)	France, Germany and United Kingdom	(1) FR: Labour force survey: 93,002 observations DE: Microcensus: 685,994 observations UK: Labour force survey: 1,327,893 observations (2) FR: 2005-2007, DE: 2005-2006, UK: 1993-2007 (3) FR-DE-UK: OLS regressions	Worker characteristics**	FR: Immigrant-native wage gaps are persistent across generations for immigrants from Africa and Turkey. F-G and S-G immigrants from Asia out-earn or receive similar wages as natives. DE: There is no evidence of wage improvement across generations for immigrants from non-EU Eastern Europe and Turkey. UK: S-G immigrants from Asia, Africa and the Caribbean receive higher wages than their F-G peers but still lag behind natives.
Athari et al. (2019)***	France	(1) Labour force survey: 233,000 observations (2) 2013-2018 (3) Unconditional quantile regressions	Worker characteristics**, part-time work and sectors (NACE1)	S-G immigrants perform better than their F-G peers, irrespective of their geographical origin and position in the wage distribution. S-G immigrants from the Maghreb and Sub-Saharan Africa still experience immigrant-native wage gaps, to an increasing extent along the wage distribution. S-G immigrants from Turkey and Southern Asia perform on par with natives at any quantile.
Belfi et al. (2021)	Netherlands	(1) Individual survey: 5,984 observations (2) 2008-2012, 2015 (3) OLS regressions	Worker characteristics**, study province and dummy for living abroad.	Among recent university graduates, there is evidence of wage parity between Dutch natives and immigrants from non-Western countries across two generations.
Borjas (1993)	United States	(1) Decennial censuses: 783,020 observations (2) 1940, 1950, 1960, 1970 (3) OLS regressions	Age, education, marital status and metropolitan residence	S-G immigrants from Cuba, Mexico and the Philippines perform better than their F-G peers but worse than natives. S-G immigrants from China reverse the negative immigrant-native wage gap their F-G peers face.
Card et al. (2000)	United States	(1) Population surveys: 920,993 observations (2) 1940, 1970, 1994-1996 (3) OLS regressions	Age, region and origin composition	The wages of S-G female and male immigrants from Latin America are higher than those of their F-G same-gender peers but remain behind those of natives. Female and male immigrants from Asia and the Caribbean out-earn or perform similarly to same-gender natives across two generations.
Duncan and Trejo (2018)	United States	(1) Population survey: around 60,000 observations (2) 2003-2016 (3) Weighted OLS regressions	Worker characteristics**	S-G male immigrants from Latin America, Africa and Asia face immigrant-native wage gaps, although to a much lesser extent than those experienced by their F-G same-gender peers. S-G female immigrants from Asia out-earn female natives, while S-G female immigrants from Latin America attain wage parity with female natives.

(Continued)

**Table 1 - (Continued)**

Authors	Country	Data (1) / Time span (2) / Methodology (3)	Covariates	Main findings
Ekberg et al. (2010)	Sweden	(1) Grandparent-parent-child linkage: 25,118 pairs (2) 1960, 1980, 2003 (3) OLS regressions and SUR models	Age, education, gender, marital status and region of residence	F-G male immigrants born in non-Western European countries experience an immigrant-native wage advantage, which disappears for their sons. Female immigrants experience no immigrant-native wage gap across generations.
Hammarstedt (2009)	Sweden	(1) Grandparent-parent-child linkage: 9,560 pairs (2) 1968, 1970, 1980, 1985, 1999, 2001, 2003 (3) OLS regressions	Age, education, marital status and region of residence	There is downward intergenerational earnings mobility among immigrants from non-Western European countries.
Hammarstedt and Palme (2012)	Sweden	(1) Parent-child linkage: * (2) 1975, 1980, 1997-1999 (3) OLS regressions	Age, gender, region of residence and occupations (ISCO3)	Immigrant-native wage gaps for immigrants from Africa, Turkey and the Middle East expand across generations. In contrast, S-G immigrants from Eastern Europe, Latin America and Asia reverse the immigrant-native wage gap their parents face.
<b><i>Second generation vs. Natives</i></b>				
Aeberhardt et al. (2010)	France	(1) Household survey: 40,000 observations (2) 2003 (3) Weighted OLS, MLE and two-step Heckman regressions, and Oaxaca-Blinder decompositions	Worker characteristics** and part-time work	S-G immigrants from Africa experience a sizeable overall wage gap. However, between two- and three-quarters of this gap is explained by covariates.
Dustmann et al. (2011)	United Kingdom	(1) Labour force survey: * (2) 1998-2009 (3) OLS regressions	Worker characteristics** and part-time work	S-G immigrants with non-white ethnicity earn substantially less than white British natives. There is wage parity between British natives and S-G immigrants from Bangladesh and China.
Gueye and Ceci-Renaud (2022)	France	(1) Administrative wage data: 394,446 observations (2) 2002-2014 (3) Random effects regressions	Worker characteristics, parents' profession, part-time work, occupations (ISCO2) and firm size	S-G immigrants from the Maghreb and Sub-Saharan Africa experience a significant immigrant-native wage gap, while there is no wage gap between French natives and S-G immigrants from Turkey.
Langevin et al. (2013)	France	(1) Individual survey: 6,778 observations (2) 2008-2009 (3) Weighted OLS and two-step Heckman regressions, Oaxaca-Blinder decompositions	Worker characteristics**, city size, occupations and sectors	S-G immigrants from Africa and Turkey receive lower wages than French natives, while S-G immigrants from Asia and Eastern Europe attain wage parity with French natives.
Rooth and Ekberg (2003)	Sweden	(1) Cross-sectional sample: 192,443 observations (2) 1998 (3) Oaxaca-Blinder decompositions	Age, education, gender, marital status and region of residence	The earnings outcomes of S-G immigrants with a non-European background are worse than those of Swedish natives.
Sakamoto et al. (2010)	United States	(1) Population survey: 4,011,429 observations (2) 1994-2006 (3) OLS regressions	Age, education, gender, region of residence and people with disability	S-G male immigrants with an African background earn substantially less than white male natives. The wages of S-G female immigrants with an African background are comparable to those of white female natives.

*Notes:* \* The number of observations is not specified in the empirical study. \*\*Worker characteristics: age, gender, education, experience or tenure, and region of residence. \*\*\* Using the same database but with a shorter period (2013-2016), Boutchenik and Le (2017) find similar results for S-G immigrants from the Maghreb.

Algan et al. (2010), Hammarstedt (2009) and Rooth and Ekberg (2003) find that in Germany and Sweden, the adjusted wage gap between natives and immigrants from developing countries remains relatively constant across generations. By contrast, Belfi et al. (2021) show that in the Netherlands, among recent graduates, there is no adjusted wage gap between Dutch natives and immigrants from developing countries across two generations. More nuanced findings have emerged for France, the United Kingdom and the United States, where although S-G immigrants from developing countries perform better than their F-G peers, the former still experience adjusted wage gaps (e.g. Abramitzky et al., 2021; Athari et al., 2019; Duncan et Trejo, 2018).

Moreover, focusing on the second generation, existing evidence also varies according to geographical origin and gender. For instance, in France and the United Kingdom, some studies show that while there is an adjusted wage gap for S-G immigrants from Africa, the Maghreb and the Near and Middle East, there is no evidence of such a gap for S-G immigrants from Asia and Eastern Europe (e.g. Aeberhardt et al., 2010; Langevin et al., 2013; Dustmann et al., 2011). In the United States, Duncan and Trejo (2018) and Sakamoto et al. (2010) find that, while S-G female immigrants from developing countries perform similarly or better than female natives, their S-G male counterparts still face an adjusted wage penalty.

Finally, it is worth noting that most studies that take an intergenerational perspective on the wages of immigrants from developing countries present some econometric and data limitations such as: i) some studies focus exclusively on the wage gaps between natives and S-G immigrants, which does not enable us to build up a comprehensive picture of the evolution of immigrants' wages across generations; ii) some studies cover small samples or short periods, which considerably reduces the external validity of their results; and iii) some studies only conduct standard OLS regressions and/or control exclusively for worker characteristics (e.g. age, gender and education) in their regressions, leading to potential estimation issues such as omitted variable bias and heterogeneity along the wage distribution (i.e. immigrant-native wage gaps at the mean are likely to differ from those at the upper and lower parts of the wage distribution).

Moreover, only a few studies focus on the overall wage gaps between natives and immigrants across generations (i.e. the wage gap without controlling for covariates or fixed effects) (e.g. Abramitzky et al., 2021; Belfi et al., 2021). However, these gaps are also crucial in

intergenerational studies as they capture the evolution of immigrants' wages across generations without accounting for compositional effects. In other words, adjusted wage gaps may hide endogenous discrimination that might result from occupational and sectoral segregation, overconcentration in part-time jobs and non-recognition of foreign tertiary diplomas. Therefore, against this background, more research is needed using granular data and advanced econometric methods.

### 3. Methodology

Our paper investigates the wage gap between workers born in developed countries and workers from developing countries across two generations. To achieve this goal, we begin with a weighted multilevel log-linear approach.<sup>54</sup> Our full benchmark specification is written as follows:

$$\log(w_{it}) = \beta_0 + \sum_{k=1}^3 \beta_k origin_{itk} + \mathbf{z}_{it}\boldsymbol{\vartheta} + \mathbf{g}_{it}\boldsymbol{\lambda} + \mathbf{f}_{it}\boldsymbol{\xi} + \psi_s + \delta_t + \varepsilon_{it} \quad (1)$$

where the dependent variable is the logarithmic real gross hourly wage of a worker  $i$  at time  $t$ .<sup>55</sup> The main explanatory variable is  $origin_{itk}$ , which is categorized into four groups  $k$ : 1) workers born in developed countries with both parents born in developed countries (i.e. the reference group), 2) workers born in developing countries (i.e. F-G immigrants born in developing countries), 3) workers born in Belgium with at least one foreign parent born in a developing country (i.e. S-G immigrants from developing countries), and 4) workers born in developing

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<sup>54</sup> Log-linear estimates can be misleading in the presence of heteroskedasticity, as OLS regressions assume homoscedasticity for consistency (Silva and Tenreyro, 2006). Consequently, as a robustness test, we also relied on the so-called Poisson pseudo-maximum-likelihood estimator with multiple high-dimensional fixed effects (STATA code: *ppmlhdfc*) in order to deal with potential heteroskedasticity problems in our log-linear regressions with firm and year fixed effects (Correia et al., 2020; Motta, 2019). The findings with this robust estimator (available on request) are largely similar to those obtained using a log-linear estimator. Therefore, we can conclude that the potential presence of heteroskedasticity in our benchmark regressions does not lead to misleading conclusions (based on our log-linear estimates). Moreover, since the use of a log-linear approach facilitates the implementation of reweighted RIF-OB decompositions, this is the approach we have adopted throughout our analysis.

<sup>55</sup> Gross hourly wages are deflated to 2013 prices. They include base pay, overtime compensation, performance-related pay and commissions, and annual and irregular bonuses.

countries with both parents born in developed countries (i.e. others).<sup>56</sup> To do so, we use the classifications of the IMF (2019) and the United Nations (2019), which have been constructed according to the geographic location of countries and their primary economic conditions (e.g. gross national income per capita, export diversification and degree of integration into the global financial system). Appendix 1 presents a chart of developed and developing countries.

There are often classification issues when S-G immigrants' parents have different countries of birth. In principle, those cases would imply identifying workers of mixed origin. However, this procedure is statistically inappropriate because origin combinations may result in several workers' groups with few observations and challenging coefficient interpretations (see Heath and Cheung (2007) for further discussion). Hence, we do not attempt to identify mixed groups but to define particular groups of origin. More precisely, the second generation in our empirical strategy has been firstly determined by the father's country of birth, except if the father was born in a developed country and the mother in a developing country. In that case, the mother's country of birth has been used. This approach is common in recent intergenerational studies (e.g. Corluy et al. 2015; Piton and Rycx 2021).<sup>57</sup>

Moreover, as wages do not only depend on workers' origin, we also introduce an extensive range of covariates and fixed effects in our benchmark model. In order to facilitate the presentation of our covariates and their corresponding coefficients in equation (1), they are written as vectors in the following manner:

$$\begin{aligned} \underline{\mathbf{z}}_{it} &= (z_{it1}, \dots, z_{itM})^T & \underline{\boldsymbol{\vartheta}} &= (\vartheta_1, \dots, \vartheta_M)^T \\ \underline{\mathbf{g}}_{it} &= (g_{it1}, \dots, g_{itL})^T & \underline{\boldsymbol{\lambda}} &= (\lambda_1, \dots, \lambda_L)^T \\ \underline{\mathbf{f}}_{it} &= (f_{it1}, \dots, f_{itQ})^T & \underline{\boldsymbol{\xi}} &= (\xi_1, \dots, \xi_Q)^T \end{aligned}$$

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<sup>56</sup> The category 'others' was created because workers born in developing countries with both parents born in developed countries earn more than any other group of origin and have better worker and employment characteristics than immigrants from developing countries (see Table 3). One might expect these workers to be the children of expatriates, who are generally highly educated and have a high socio-economic level. Consequently, considering these workers as F-G immigrants born in developing countries could lead to misleading conclusions.

<sup>57</sup> S-G immigrants from developing countries are likely to perform better in the labour market if one of their parents is native (or born in a developed country). Consequently, we also tested this hypothesis with our data. The results show that S-G immigrants whose two parents were born in a developing country receive wages similar to those of S-G immigrants whose father was born in a developed country (including Belgium) and whose mother was born in a developing country. On the other hand, the wages of S-G immigrants whose mother was born in a developed country (including Belgium) and whose father was born in a developing country are lower than those of other S-G immigrants. However, after controlling for the complete set of covariates, we find that all S-G immigrant groups perform similarly in terms of wages. These results are available on request.

where  $\underline{\mathbf{z}}_{it}$  is a  $M \times 1$  vector of observations on worker characteristics (i.e. age, squared age, gender, educational attainment, tenure, squared tenure and type of household);  $\underline{\mathbf{g}}_{it}$  is a  $L \times 1$  vector of observations on employment characteristics (i.e. type of contract, occupations at the two-digit ISCO level and dummies for part-time and overtime work);  $\underline{\mathbf{f}}_{it}$  is a  $Q \times 1$  vector that contains observations on the firm where the worker is employed (i.e. size of firm, region where firm is located and dummies for the existence of firm-level collective agreements and the type of economic and financial control);  $\psi_s$  denotes firm fixed effects (sector fixed effects at a two-digit NACE level are also used in one of our benchmark specifications);  $\delta_t$  represents year fixed effects; and  $\varepsilon_{it}$  is the error term, which is clustered at the firm level.<sup>58</sup> It should be noted that the error term follows the distribution  $\varepsilon_{it} \sim N(0, \frac{\sigma^2}{\omega_{it}})$ , where  $\omega_{it}$  are known weights for workers and firms and  $\sigma^2$  is an unknown parameter that is estimated in the regression.<sup>59</sup>

We also extend our analysis to the role of three moderating variables. First, in order to take into account more fine-grained characteristics linked to workers' country of birth or that of their parents (e.g. degree of human capital transferability, quality of the education system, socioeconomic background, labour market outcomes, patronymic, physical appearance and religion), immigrants from developing countries are also classified by geographical origin, as follows: i) the Maghreb countries, ii) Sub-Saharan African countries, iii) the Near and Middle Eastern countries, iv) non-EU Eastern European countries, v) emerging and developing Asian countries, and vi) Latin American and Caribbean countries (see Appendix 3 for a list of countries by geographical region).

Furthermore, in order to fully assess the extent to which being a woman, in interaction with origin, shapes overall and adjusted wage gaps, equation (1) has been reformulated (and estimated) as follows:

$$\log(w_{it}) = \beta_0 + \sum_{k=1}^7 \beta_k \text{gender\_origin}_{itk} + \mathbf{Z}_{it}\boldsymbol{\beta}_i + \mathbf{E}_{it}\boldsymbol{\beta}_i + \mathbf{F}_{it}\boldsymbol{\beta}_i + \psi_s + \delta_t + \varepsilon_{it} \quad (2)$$

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<sup>58</sup> The clustering procedure is at the firm level because the sampling design of our database is based on workers randomly selected within each firm. The clustering procedure is further at the firm level rather than the firm-year level to account for serial correlation across years within a firm.

<sup>59</sup> The stratification of our database implies the use of weights. For details, see Footnote 66.

where the main explanatory variable ‘*gender\_origin*’ is categorised in the following manner: 1) male workers born in developed countries with both parents born in developed countries (reference group), 2) female workers born in developed countries with both parents born in developed countries, 3) F-G male immigrants born in developing countries, 4) F-G female immigrants born in developing countries, 5) S-G male immigrants from developing countries, 6) S-G female immigrants from developing countries, 7) Other male workers, and 8) Other female workers.<sup>60</sup>

Finally, we use an advanced econometric technique, the so-called reweighted RIF-OB decompositions, to explore how the position in the wage distribution shapes overall wage gaps and identify the contribution of observables to these gaps. In addition, we further investigate the role of gender along the wage distribution by conducting reweighted RIF-OB decompositions for female and male workers, separately. It should be noted that we do not use standard OLS regressions because although conditional quantile estimates at the mean can be generalized to the population through the law of iterated expectations, this generalization cannot be applied to the quantiles<sup>61</sup> (i.e. OLS regressions do not focus on the actual quantiles of wages and affect the whole wage distribution, leading to unexpected results in any quantile under study). Firpo et al. (2009) solve this issue by suggesting the use of unconditional quantile regressions via a recentered influence function (RIF). The RIF represents the contribution of an individual observation to the distributional statistic of interest (e.g. mean, variance or quantiles) and replaces the dependent variable in the regression model.

The RIF can estimate *ceteris paribus* the marginal effect of an infinitesimal change in the explanatory variable on the unconditional distribution of the dependent variable (i.e. unconditional quantile regressions). However, the RIF cannot be used to estimate the effect of large changes in the distribution of the explanatory variable (e.g. changes in dummy or categorical variables), as RIF regressions only provide local approximations. To deal with this statistical issue, Firpo and Pinto (2016) propose the use of a reweighted RIF. This methodology

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<sup>60</sup> Our equation (2) delivers the same results as a regression with interaction effects. The advantage of our specification is that it directly (and parsimoniously) estimates coefficients associated with the overall effect of gender, origin, and the interaction between these variables for each group. In contrast, in a regression with interaction effects, each coefficient associated with gender, origin, and the interaction variable must be summed to obtain the overall effect for each group.

<sup>61</sup> The law of iterated expectations states that at the mean, the expected value of a dependent variable  $Y$  conditioning on an explanatory variable  $X$  is equal to the expected value of that dependent variable:  $E[Y|X] = E[Y]$ . However, this property is not available for any quantile  $\tau$ :  $Q_\tau[Y|X] \neq Q_\tau[Y]$ .

implements parametric or nonparametric strategies (e.g. logit regressions) to obtain inverse probability weights that can be used to identify counterfactual distributions and, consequently, obtain treatment effects on the distributional statistic.

Moreover, the reweighted RIF can extend and refine the Oaxaca-Blinder (OB) decompositions when researchers are interested in distributional statistics beyond the mean. Specifically, Firpo et al. (2018) suggest the use of RIF regressions with a reweighted strategy to decompose differences between a control group and a treatment group into two components: the gap attributed to differences in observable characteristics (a composition effect) and the gap attributed to differences in the relationships between the dependent variable and covariates (a wage structure effect). This multistep technique is referred to as reweighted RIF-OB decompositions.<sup>62</sup> It is worth noting that in the framework of a standard OB, a composition effect is equivalent to quantity effects (i.e. differences in average characteristics), and a wage structure effect is associated with price effects (i.e. differences in the returns to average characteristics).

In our paper, reweighted RIF-OB decompositions between male (female) workers born in developed countries and male (female) workers from developing countries can be defined as follows:<sup>63</sup>

$$\hat{\Delta}_{RIF-OB}^q = \underbrace{(\bar{X}_0^C - \bar{X}_0)' \hat{\beta}_0^q}_{\Delta_{X,p}^q} + \underbrace{(\beta_C^q - \beta_0^q) \bar{X}_0^C'}_{\Delta_{X,e}^q} + \underbrace{(\beta_1^q - \beta_C^q) \bar{X}_1'}_{\Delta_{S,p}^q} + \underbrace{(\bar{X}_1 - \bar{X}_0^C)' \beta_C^q}_{\Delta_{S,e}^q} \quad (3)$$

where  $\bar{X}$  corresponds to the vector of all observables mentioned in equation (1),  $\bar{X}_0$  being that for male (female) workers born in developed countries,  $\bar{X}_1$  that for male (female) immigrants from developing countries, and  $\bar{X}_0^C$  that for counterfactual male (female) workers born in developed countries but with the distribution of observed and unobserved characteristics of male (female) workers from developing countries;  $\beta_0^q$  represents the RIF-regression coefficients of male (female) workers born in developed countries;  $\beta_1^q$  represents the RIF-regression coefficients of male (female) workers from developing countries; and  $\beta_C^q$  represents

<sup>62</sup> We use the STATA codes *oaxaca\_rif* and *rwlogit*, provided by Rios-Avila (2020), to estimate reweighted RIF-OB decompositions.

<sup>63</sup> By ‘workers from developing countries’, in reweighted RIF-OB decompositions, we refer to F-G immigrants born in developing countries and S-G immigrants from developing countries, respectively.

the reweighting RIF-regression coefficients when the data of male (female) workers born in developed countries are reweighted using logit regressions in order to have the same distribution of characteristics as the data of male (female) workers from developing countries.

Furthermore, the aggregate four terms on the right-hand side of equation (3) can be read as follows: the sum of  $\Delta_{X,p}^q$  and  $\Delta_{X,e}^q$  represents the total composition effect (i.e. the quantity effects for the counterfactual group), where  $\Delta_{X,p}^q$  is the pure composition effect delivered by covariates and  $\Delta_{X,e}^q$  is the specification error that assesses the quality of the regression model (i.e. RIF approximation); and the sum of  $\Delta_{S,p}^q$  and  $\Delta_{S,e}^q$  indicates the total wage structure effect (i.e. the price effects for the counterfactual group), where  $\Delta_{S,p}^q$  is the pure wage structure and  $\Delta_{S,e}^q$  is the reweighting error that assesses the quality of the reweighting procedure. It should be noted that bootstrap standard errors must be estimated in reweighted RIF-OB decompositions because these are based on a multi-stage procedure (i.e. RIF regressions and predicted inverse probability weights) (Firpo et al., 2018; Rios-Avila, 2020).<sup>64</sup>

As our database contains a large number of worker, employment and firm characteristics, we group them in the following manner to facilitate the presentation of the reweighted RIF-OB decompositions: i) Age: age and squared age; ii) Tenure: tenure and squared tenure; iii) Education: dummies for at most lower secondary, upper secondary and tertiary education; iv) Household: dummies for single persons, couples without children living at home, couples with children living at home, single parents and other households; and v) Employment and firm: type of contract (dummies for permanent, fixed term, apprenticeship and internship contracts), dummies for part-time and overtime work, 36 occupational dummies, size of the firm (FTE number of workers in log), a dummy for more than 50% privately owned firms, a dummy for firm-level collective agreement, region where the firm is located (dummies for Brussels, Flanders and Wallonia), 66 sectoral dummies and 18 year dummies. When it comes to categorical and dummy variables, the detailed reweighted RIF-OB decompositions are influenced by the choice of the omitted category. To deal with this issue, we compute the

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<sup>64</sup> Firpo et al. (2018) suggest using 500 repetitions to estimate bootstrap standard errors in reweighted RIF-OB decompositions. However, their suggestion is based on small samples. Using our database, we observe that as of 100 repetitions, bootstrap standard errors tend to be largely stable. In addition, a bootstrap procedure is highly time-consuming in large and granular databases. Therefore, the bootstrap standard errors of our decompositions are estimated using 100 repetitions.

decompositions based on the normalized effects of categorical variables or sets of dummies (i.e. effects that are expressed as deviations from the mean).

**Table 2. Descriptive statistics by origin – means and percentages, 1999-2016**

	Sample of workers born in or from		
	Developed countries	Developing countries <sup>a</sup>	
		First generation	Second generation <sup>b</sup>
Share of the sample by origin (%) <sup>c</sup>	88.7	7.1	3.4
<b>Region of birth (%)<sup>d</sup></b>			
<b>Developed countries</b>			
Belgium (n = 969,398)	83.5		
EU-14 countries (n = 179,765)	14.6		
Other EU countries (n = 17,018)	1.5		
Other developed countries (n = 4,621)	0.4		
<b>Developing countries</b>			
Maghreb countries (n = 50,175)		36.7	43.3
Sub-Saharan African countries (n = 27,253)		18.9	23.3
Near and Middle Eastern countries (n = 25,444)		19.4	22.6
Non-EU Eastern European countries (n = 12,419)		10.9	6.7
Emerging and developing Asian countries (n = 8,979)		8.5	3.2
Latin American and Caribbean countries (n = 5,777)		5.6	1.7
<b>Worker characteristics</b>			
Real gross hourly wage (in EUR) <sup>e</sup>	20.3	16.8	17.4
Age	38.2	38.2	30.2
Women (%)	31.6	28.7	34.1
Tenure	9.1	5.1	4.0
Education (%):			
At most lower secondary	28.9	50.9	29.4
Upper secondary	42.2	35.3	45.1
Tertiary	28.9	13.7	25.5
Household (%):			
Single person	12.0	14.3	12.0
Couple without children living at home	18.1	11.8	12.3
Couple with children living at home	59.5	61.5	62.0
Single parent	7.8	6.5	10.6
Other households	2.6	6.0	3.1
<b>Employment characteristics</b>			
Part-time work (%)	9.7	18.9	16.3
Overtime work (%)	4.5	4.8	4.6
Type of contract (%):			
Permanent	92.5	86.0	82.4
Fixed-term	6.1	12.7	15.4
Apprenticeship	0.2	0.1	0.6
Internship	1.2	1.2	1.5
Occupational categories - ISCO1 (%):			
Managers	4.3	1.5	2.4
Professionals	12.6	5.8	11.2
Technicians and associate professionals	9.9	4.4	9.3
Clerical support	19.5	10.9	17.6
Service and sales workers	9.9	9.8	15.1
Craft and related trades workers	17.6	18.3	12.9
Plant and machine operators and assemblers	16.1	15.2	16.4
Elementary Occupations	10.1	33.9	15.1

Table 2. (Continued)

**Table 2. Continued**

	Sample of workers born in or from		
	Developed countries	Developing countries <sup>a</sup>	
		First generation	Second generation <sup>b</sup>
<b>Firm characteristics</b>			
Sector of activity - NACE1 (%):			
B - Mining and Quarrying	0.2	0.1	0.1
C - Manufacturing	35.6	24.6	25.0
D - Electricity, gas, steam and air conditioning supply	1.3	0.2	1.0
E - Water supply, sewerage, waste management and remediation activities	0.9	0.8	0.6
F - Construction	8.1	8.3	5.6
G - Wholesale and retail trade, repair of motor vehicles and motorcycles	19.7	12.4	17.1
H - Transportation and storage	9.6	9.1	11.8
I - Accommodation and food service activities	2.4	8.8	5.4
J - Information and communication	5.0	2.8	6.1
K - Financial and insurance activities	1.2	0.9	1.6
L - Real Estate activities	0.3	0.3	0.3
M - Professional, scientific and technical activities	5.3	3.1	5.1
N - Administrative and support service activities	10.4	28.9	20.2
Size of the firm (FTE number of employees)	513.3	460.8	554.1
Firm-level collective agreement (Yes) (%)	27.4	21.6	28.4
More than 50% privately owned (Yes) (%)	93.9	96.8	94.2
Region where the firm is located (%):			
Brussels	12.9	26.6	28.9
Flanders	65.3	56.8	50.1
Wallonia	21.9	16.5	21.0

*Notes:* Sample covers workers aged 15-64. Worker and firm weights are used. <sup>a</sup> By 'developing countries', we actually mean either transition and developing countries listed in the United Nations' (2019) classification and/or emerging market and developing economies listed in the IMF's (2019) classification (See Appendix 2 for a chart of developed and developing countries). <sup>b</sup> S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. <sup>c</sup> The category 'others' is also considered in the sample (0,8%). Therefore, the sum of shares in the table does not add up to 100%. <sup>d</sup> Appendix 3 shows the list of countries by region of birth. <sup>e</sup> At 2013 constant prices. It includes base pay, overtime compensation, performance-related pay and commissions, and annual and irregular bonuses. Source: STATBEL, 1999-2016.

## 4. Data

### 4.1 Structure of the matched employer-employee database

Our empirical investigation relies on a matched employer-employee database provided by Statistics Belgium (STATBEL). This database is the result of merging two datasets covering the period 1999-2016. The first dataset is the Structure of Earnings Survey (SES), which covers all firms operating in Belgium that employ more than ten workers and whose economic activities fall within sectors B to S (excluding O) of the NACE Rev. 2 nomenclature.<sup>65</sup> The SES contains a wealth of information provided by the management of firms, both on the

<sup>65</sup> The NACE-BEL 2008 Rev. 2 is the statistical classification of economic activities in the EU.

characteristics of firms (e.g. sector of activity, number of employees and type of collective agreement) and those of their workers (e.g. age, gender, education, tenure and occupation).<sup>66</sup>

The second dataset stems from the Belgian National Register (BNR). It contains information on workers' country of birth and that of their parents, as well as the type of household where workers live (e.g. single person, single parent or couple with children). The linkage between the SES and the BNR datasets was carried out by STATBEL using workers' National Register numbers, resulting in a cross-sectional sample of 1,609,543 observations.

Four filters were applied to the original database. First, we dropped firms with less than ten observations to ensure sufficient variation in estimating wage gaps at the firm level (i.e. regressions with firm fixed effects) (58,252 observations deleted)<sup>67</sup>. Second, in order to focus exclusively on the working-age population employed in the Belgian private sector, we kept only data for workers aged between 15 and 64 and firms operating in sectors B to N of the NACE-BEL 2008 Rev. 2 nomenclature (47,240 observations deleted).<sup>68</sup> Third, zero earnings observations were excluded to avoid statistical bias in estimating wage gaps (3,813 observations deleted). Fourth, to avoid misclassification by origin and generation, we filtered out workers for whom information on their country of birth was missing (27,131 observations deleted) or

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<sup>66</sup> The SES is conducted on the basis of a two-stage random sampling approach of enterprises or local units (first stage) and employees (second stage). The establishments, randomly chosen from the population, report data on a random sample of their workers. The SES is thus a stratified sample. The stratification criteria refer sequentially to the region (NUTS groups), the principal economic activity (NACE groups) and the size of the firm. The sample size in each stratum depends on the size of the firm. Sampling percentages of firms are equal to 10, 50 and 100 percent, respectively, when the number of workers is lower than 50, between 50 and 99, and above 100, respectively. Within a firm, sampling percentages of employees also depend on size. Sampling percentages of employees reach 100, 50, 25, 14.3 and 10 per cent, respectively, when the number of workers is lower than 20, between 20 and 50, between 50 and 99, between 100 and 199, and between 200 and 299, respectively. Firms employing 300 or more workers must report information for an absolute number of employees. This number ranges between 30 (for firms with between 300 and 349 workers) and 200 (for firms with 12,000 workers or more). To guarantee that firms report information on a representative sample of their workers, they are asked to follow a specific procedure. First, they have to rank their employees in alphabetical order. Next, Statistics Belgium gives them a random letter (e.g. the letter O) from which they have to start when reporting information on their employees (following the alphabetical order of workers' names in their list). If they reach the letter Z and still have a number of employees on which they need to provide information, they have to continue from the letter A on their list. Moreover, firms that employ different categories of workers, namely managers, blue- and/or white-collar workers, have to set up a separate alphabetical list for each of these categories and to report information on the number of workers in these different groups that is proportional to their share of the firm's total number of employees. For example, a firm with 500 employees (e.g. 80 managers, 100 white-collar workers and 320 blue-collar workers) will have to report information on 50 workers (e.g. 8 managers, 10 white-collar workers and 32 blue-collar workers).

<sup>67</sup> Our results remain largely unchanged if this restriction is not imposed (estimates are available on request).

<sup>68</sup> More precisely, our final sample covers the following sectors: (B) mining and quarrying, (C) manufacturing, (D) electricity, gas, steam and air conditioning supply, (E) water supply, sewerage, waste management and remediation, (F) construction, (G) wholesale and retail trade, repair of motor vehicles and motorcycles, (H) transportation and storage, (I) accommodation and food service activities, (J) information and communication, (K) financial and insurance activities, (L) real estate activities, (M) professional, scientific and technical activities, and (N) administrative and support service activities.

on at least one of their parents' countries of birth. (162,343 observations deleted).<sup>69</sup> After applying the four filters, our final sample consists of 1,310,764 observations across 18,057 firms from 1999 to 2016.

## 4.2 Descriptive statistics

The population breakdown by origin and generation is at the top of Table 2. We first observe that workers born in developed countries constitute about 89% of our final sample. Among them, natives (i.e. workers born in Belgium with both parents were born in Belgium) and workers originating from EU-14 countries are the largest groups. Turning to our groups of interest, F-G immigrants born in developing countries represent 7.1% of our final sample, whereas their S-G counterparts make up 3.4%. Most originate from the Maghreb, Sub-Saharan Africa and the Near and Middle East, regardless of their generation. It is worth noting that, as expected, the distribution of workers by geographical origin in our sample mirrors that of the working-age population in Belgium (FPS Employment and Unia, 2019).

Table 2 also displays descriptive statistics for all variables included in our empirical strategy. Regarding our main variable of interest (i.e. wages), we observe that workers born in developed countries earn, on average, 20.3 euros per hour, while F-G immigrants born in developing countries and their S-G peers earn 16.8 and 17.4 euros per hour, respectively. When it comes to worker characteristics, around 1 in 3 workers in our final sample are women. The average age is similar for workers born in developed countries and F-G immigrants born in developing countries (38 years old). By contrast, S-G immigrants from developing countries are eight years younger than the other groups, which further explains their low level of job tenure. In terms of tertiary education, S-G immigrants from developing countries perform much better than their F-G peers (25.5% vs. 13.7%), although they still lag somewhat behind workers born in developed countries (28.9%).

Regarding job characteristics, the shares of workers from developing countries in part-time jobs are almost twice those of workers born in developed countries, regardless of their generation.

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<sup>69</sup> Around 10% of the observations in our sample were thus deleted because of missing information on the country of birth of at least one of the workers' parents. However, this is unlikely to affect our conclusions regarding adjusted wage differentials, particularly for S-G immigrants from developing countries. Indeed, our results (available on request), with and without covariates, show that the wages of workers born in developed countries for whom information on the country of birth of at least one of their parents is missing are similar to those of our reference group (i.e. workers born in developed countries with both parents born in developed countries).

Workers from developing countries are also more likely to have fixed-term contracts than workers born in developed countries, irrespective of their generation. As regards occupations, we find that the share of F-G immigrants born in developing countries and employed in elementary occupations (e.g. cleaner, agricultural worker and labourer in construction) is more than three times higher than that of workers born in developed countries (33.9% vs. 10.1%). However, this share decreases by more than half for their S-G counterparts (15.1%).

Among workers from developing countries, we also observe that the proportion of managers, professionals and technicians increases across two generations. Finally, F-G immigrants born in developing countries are considerably overrepresented in sector I (accommodation and food service activities) and sector N (administrative and support service activities) relative to workers born in developed countries. However, this overrepresentation decreases somewhat across two generations. Indeed, S-G immigrants from developing countries are more clustered in sector G (wholesale and retail trade, repair of motor vehicles and motorcycles), sector J (information and communication) and sector M (professional, scientific, and technical activities) than their F-G counterparts.

## 5. Results

### 5.1. Benchmark specification

Table 3 presents our benchmark estimates regarding the real gross hourly wage gaps between workers born in developed countries and workers from developing countries across two generations.<sup>70</sup> In column (1), when only year fixed effects are included, our findings show that the overall wage gap for F-G immigrants born in developing countries stands at 17.1%, while that for their S-G peers is 14.4%.<sup>71</sup> Put another way, the wages of S-G immigrants from developing countries are not, on average, markedly better than those of their F-G counterparts.<sup>72</sup>

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<sup>70</sup> The term ‘wage gap’, as used in the discussion of our findings, refers to the real gross hourly wage gap.

<sup>71</sup> The coefficients in the tables (and percentages reported in the text) must be interpreted as log points. However, in order to obtain the % change in euros following a unit change in a dummy variable, the following formula must be applied:  $100 * [\exp(\beta) - 1]$ .

<sup>72</sup> We also find that workers born in developing countries with both parents born in Belgium, called ‘others’ in this paper, earn 12.8% more than workers born in developed countries, thus performing far better than immigrants from developing countries. As our empirical analysis focuses on the labour market performance of immigrants from developing countries, the results associated with the category ‘others’ are no longer explicitly shown in Table 4 and onwards. However, they are available on request.

**Table 3. Baseline: weighted multilevel log-linear regressions**

Workers born in or from:	Log (Real gross hourly wage)				
	(1)	(2)	(3)	(4)	(5)
<b>Developed countries</b> (n = 1,170,802)	Reference	Reference	Reference	Reference	Reference
<b>Developing countries<sup>a</sup></b>					
First generation (n = 87,693)	-0.171*** (0.007)	-0.062*** (0.004)	-0.033*** (0.004)	-0.034*** (0.003)	-0.029*** (0.002)
Second generation (n = 42,354)	-0.144*** (0.007)	0.005 (0.005)	0.010* (0.006)	-0.001 (0.004)	-0.002 (0.002)
Others <sup>b</sup> (n = 9,915)	0.128*** (0.009)	0.042*** (0.006)	0.027*** (0.004)	0.027*** (0.004)	0.022*** (0.003)
<u>Control variables</u>					
Women		-0.131*** (0.004)	-0.092*** (0.005)	-0.088*** (0.003)	-0.078*** (0.003)
Age		0.030*** (0.001)	0.023*** (0.001)	0.023*** (0.001)	0.021*** (0.001)
Squared age		-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Tenure		0.013*** (0.001)	0.011*** (0.001)	0.010*** (0.000)	0.009*** (0.000)
Squared tenure		-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Education (ref. at most lower secondary)					
Upper secondary		0.109*** (0.004)	0.066*** (0.006)	0.051*** (0.003)	0.050*** (0.003)
Tertiary		0.493*** (0.007)	0.209*** (0.012)	0.171*** (0.005)	0.147*** (0.007)
Type of household (ref. single person)					
Couple without children living at home		0.010*** (0.002)	0.004*** (0.001)	0.004*** (0.001)	0.005*** (0.001)
Couple with children living at home		0.016*** (0.002)	0.012*** (0.001)	0.012*** (0.001)	0.014*** (0.001)
Single parent		-0.016*** (0.002)	-0.009*** (0.002)	-0.006*** (0.001)	-0.003** (0.001)
Other households		0.007** (0.003)	0.002 (0.003)	0.004* (0.002)	0.002 (0.002)
Type of contract (ref. permanent)					
Fixed term			-0.031*** (0.006)	-0.038*** (0.010)	-0.037*** (0.008)
Apprenticeship			-0.225*** (0.022)	-0.223*** (0.022)	-0.227*** (0.021)
Internship			-0.002 (0.037)	-0.003 (0.027)	-0.028** (0.014)
Part-time work			-0.045*** (0.006)	-0.029*** (0.005)	-0.025*** (0.003)
Overtime work			0.016* (0.009)	0.017*** (0.004)	0.004 (0.003)

Table 3. (Continued)

**Table 3. Continued**

	Log (Real gross hourly wage)				
	(1)	(2)	(3)	(4)	(5)
Size of the firm (FTE number of employees in log)				0.025*** (0.002)	0.006*** (0.002)
Firm-level collective agreement (Yes)				0.024*** (0.004)	0.002 (0.003)
More than 50% privately owned (Yes)				0.008 (0.014)	0.025 (0.029)
Region (ref. Brussels)					
Flanders				-0.007 (0.005)	-0.008 (0.005)
Wallonia				-0.035*** (0.007)	-0.027*** (0.010)
Year fixed effects <sup>c</sup>	Yes	Yes	Yes	Yes	Yes
Occupations (ISCO2) <sup>d</sup>	No	Yes	Yes	Yes	Yes
Sector fixed effects (NACE2) <sup>e</sup>	No	No	No	Yes	No
Firm fixed effects <sup>f</sup>	No	No	No	No	Yes
Observations	1,310,764	1,305,599	1,304,303	1,303,510	1,303,510
Adjusted R-squared	0.04	0.49	0.60	0.64	0.70

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Robust standard errors are in parentheses, which are clustered at the firm level. Worker and firm weights are used in all our regressions. Sample covers workers aged 15-64. <sup>a</sup> S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. <sup>b</sup> The category 'others' refers to workers born in developing countries with both parents born in Belgium (see Section 3 for more details). <sup>c</sup> 17 year dummies. <sup>d</sup> 35 occupation dummies. <sup>e</sup> 65 sector dummies. <sup>f</sup> 17,899 firm dummies. Source: STATBEL, 1999-2016.

However, although our estimates in column (1) show a clear picture of the level of overall wage inequality by origin and generation in Belgium, it is unlikely that workers' country of birth or that of their parents entirely explain their wages. Thus, covariates are progressively included in Table 3. In column (2), we find that after controlling for worker characteristics (i.e. gender, age, squared age, education, tenure, squared tenure and type of household), the adjusted wage gap for F-G immigrants born in developing countries stands at 6.2%. By contrast, there is no evidence of a statistically significant adjusted wage gap for their S-G counterparts.

Then, the inclusion of employment characteristics (i.e. type of contract, part-time and overtime work and occupation at ISCO two-digit level) in column (3) reduces by almost half the adjusted wage gap for F-G immigrants born in developing countries observed in column (2), now 3.3%. The inclusion of firm characteristics (i.e. size of the firm, firm-level collective agreement, type of economic and financial control and region where the firm is located) and sector fixed effects at the NACE two-digit level in column (4) does not significantly affect the adjusted wage gap for F-G immigrants born in developing countries. Moreover, columns (3) and (4) show no evidence of an adjusted wage gap for S-G immigrants from developing countries.

**Table 4: Geographical origin: weighted multilevel log-linear regressions**

Workers born in or from:	Log (Real gross hourly wage)		
	(1)	(2)	
<b>Developed countries</b> (n = 1,170,802)	Reference	Reference	
<b>Developing countries<sup>a</sup></b>			
Maghreb countries	First generation (n = 32,365)	-0.178*** (0.011)	-0.037*** (0.003)
	Second generation (n = 17,810)	-0.184*** (0.011)	-0.003 (0.004)
Sub-Saharan African countries	First generation (n = 16,472)	-0.159*** (0.008)	-0.029*** (0.003)
	Second generation (n = 10,781)	-0.042*** (0.008)	-0.009*** (0.003)
Near and Middle Eastern countries	First generation (n = 16,644)	-0.177*** (0.010)	-0.018*** (0.003)
	Second generation (n = 8,800)	-0.206*** (0.009)	0.014*** (0.003)
Non-EU Eastern European countries	First generation (n = 9,589)	-0.196*** (0.008)	-0.024*** (0.003)
	Second generation (n = 2,830)	-0.045*** (0.012)	-0.004 (0.006)
Emerging and developing Asian countries	First generation (n = 7,609)	-0.151*** (0.011)	-0.026*** (0.004)
	Second generation (n = 1,370)	-0.104*** (0.018)	-0.037*** (0.009)
Latin America and Caribbean countries	First generation (n = 5,014)	-0.136*** (0.016)	-0.016*** (0.005)
	Second generation (n = 763)	-0.141*** (0.019)	-0.039*** (0.009)
<b>Control variables</b>			
Year fixed effects <sup>b</sup>	Yes	Yes	
Worker characteristics <sup>c</sup>	No	Yes	
Employment characteristics <sup>d</sup>	No	Yes	
Firm characteristics <sup>e</sup>	No	Yes	
Occupations fixed effects (ISCO2) <sup>f</sup>	No	Yes	
Sector fixed effects (NACE2) <sup>g</sup>	No	No	
Firm fixed effects <sup>h</sup>	No	Yes	
Observations	1,310,764	1,303,510	
Adjusted R-squared	0.04	0.70	

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Robust standard errors are in parentheses, which are clustered at the firm level. Sample covers workers aged 15-64. Firm and worker weights are used. <sup>a</sup> S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. <sup>b</sup> 17 year dummies. <sup>c</sup> gender, age, squared age, educational attainment, tenure, squared tenure and type of household. <sup>d</sup> type of contract and dummies for part-time and overtime work. <sup>e</sup> Size of the firm (FTE number of workers in log), dummy for more than 50% privately owned, dummy for firm-level collective agreement and region where the firm is located (Brussels, Flanders or Wallonia). <sup>f</sup> 35 occupation dummies. <sup>g</sup> 64 sector dummies. <sup>h</sup> 17,990 firm dummies. The category 'Others' is also included in the regressions, but its estimates are not portrayed in this table. Source: STATBEL, 1999-2016.

We now place particular emphasis on the results of column (5) as they represent the estimation of our full benchmark specification (i.e. estimating adjusted wage gaps between workers with identical observable characteristics but different origins working at the same firm).<sup>73</sup> Our estimates suggest that F-G immigrants born in developing countries experience an adjusted wage gap of 2.9%. Although one might not entirely exclude the role of unobservable characteristics (e.g. motivation or language proficiency) in explaining the adjusted wage gap for F-G immigrants born in developing countries, given the large number of covariates we control for, there are solid grounds for assuming that this adjusted wage gap is at least in part associated with wage discrimination. Finally, S-G immigrants from developing countries experience no adjusted wage gap. To put it in another way, all other things being equal within a firm, S-G immigrants from developing countries outperform their F-G counterparts and are equivalent to workers born in developed countries in terms of wages.

## 5.2. Geographical origin

The overall and adjusted wage gaps for immigrants from developing countries may vary depending on their geographical origin. Hence, Table 4 presents the intergenerational relationship between origin and wages using a more fine-grained geographical classification. In column (1), where no covariate is included, except year fixed effects, our estimates suggest that the overall wage gaps for F-G immigrants born in non-EU Eastern Europe (19.6%), the Maghreb (17.8%) and the Near and Middle East (17.7%) are relatively greater than those for F-G immigrants born in Sub-Saharan Africa (15.9%), emerging and developing Asia (15.1%), and Latin America and the Caribbean (13.6%).

We also find that heterogeneity in the magnitude of the overall wage gaps for S-G immigrants from developing countries. On the one hand, the overall wage gaps for S-G immigrants from Sub-Saharan Africa (4.2%), non-EU Eastern European countries (4.5%), and emerging and developing Asia (10.4%) are significantly lower than those for their F-G peers. On the other hand, the overall wage gaps for S-G immigrants from the Maghreb (18.4%), the Near and

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<sup>73</sup> Most covariates are significant coefficients and have the expected signs. Specifically, wages increase with age and seniority, but only up to a point, as the relationships are quadratic. Wages are higher for better-educated workers and those living in couples (with or without children). Conversely, single parents and part-time or temporary workers earn less. Wages are also found to increase with firm size and to be lower in Wallonia (the southern part of the country).

Middle East (20.6%), and Latin America and the Caribbean (14.1%) are somewhat higher than those for their F-G peers.

Controlling for our complete set of covariates – including firm fixed effects – in column (2), the adjusted wage gaps for F-G immigrants born in developing countries also vary according to geographical origin, being 1.6% for those born in Latin America and the Caribbean, 1.8% for those born in the Near and Middle East, 2.6% for those born in emerging and developing Asia, 2.4% for those born in non-EU Eastern Europe, 2.9% for those born in Sub-Saharan Africa, and 3.7% for those born in the Maghreb.

Moreover, we find three patterns for the adjusted wage gaps for S-G immigrants from developing countries, depending on their geographical origin. Firstly, the adjusted wage gaps for S-G immigrants from the Maghreb, Sub-Saharan Africa and non-EU Eastern Europe are statistically insignificant or around zero (i.e. *ceteris paribus*, within a firm, these S-G immigrants attain wage parity with workers born in developed countries). Secondly, S-G immigrants from the Near and Middle East experience a positive adjusted wage gap of 1.4%, suggesting that, all else being equal, within a firm, they outperform workers born in developed countries and their F-G counterparts. Thirdly, the adjusted wage gaps for S-G immigrants from emerging and developing Asia, Latin America and the Caribbean range from 3.7% to 3.9%, thus being lower than those for their F-G counterparts.

### **5.3. Gender and origin**

As our findings in our full benchmark specification show that female workers earn 7.8% less per hour than male workers (column (5) of Table 3), the role of gender in shaping the wages of immigrants from developing countries across two generations deserves to be investigated in detail. Columns (1) and (2) of Table 5 show that the overall and adjusted wage gaps for male immigrants from developing countries are comparable to those of the benchmark scenario in Table 3. In other words, while the overall wage gap for male immigrants from developing countries remains substantial over two generations (between 15.9% and 18.6%), the adjusted wage gap decreases from 3.8% to almost zero.

**Table 5: Gender and Origin: weighted multilevel log-linear regressions**

Workers born in or from:		Log (Real gross hourly wage)	
		(1)	(2)
<b>Developed countries</b>			
Men (n = 800,464)		Reference	Reference
Women (n= 370,338) [1]		-0.149*** (0.006)	-0.081*** (0.004)
<b>Developing countries<sup>a</sup></b>			
Men	First generation (n = 64,439)	-0.186*** (0.008)	-0.038*** (0.002)
	Second generation (n = 27,922)	-0.159*** (0.008)	-0.006** (0.003)
Women	First generation (n = 23,254) [2]	-0.302*** (0.009)	-0.086*** (0.004)
	Second generation (n = 14,432) [3]	-0.257*** (0.011)	-0.076*** (0.005)
<b>Control variables</b>			
Year fixed effects <sup>b</sup>		Yes	Yes
Worker characteristics <sup>c</sup>		No	Yes
Employment characteristics <sup>d</sup>		No	Yes
Firm characteristics <sup>e</sup>		No	Yes
Occupations fixed effects (ISCO2) <sup>f</sup>		No	Yes
Sector fixed effects (NACE2) <sup>g</sup>		No	No
Firm fixed effects <sup>h</sup>		No	Yes
Test for equality of coefficients (p-value) <sup>i</sup>			
[1] = [2]		0.00	0.06
[1] = [3]		0.00	0.18
[2] = [3]		0.00	0.00
Observations		1,310,764	1,303,510
Adjusted R-squared		0.07	0.70

*Notes:* \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Robust standard errors are in parentheses, which are clustered at the firm level. Sample covers workers aged 15-64. Firm and worker weights are used. <sup>a</sup> S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. <sup>b</sup> 17 year dummies. <sup>c</sup> age, squared age, educational attainment, tenure, squared tenure and type of household. <sup>d</sup> type of contract and dummies for part-time and overtime work. <sup>e</sup> Size of the firm (FTE number of workers in log), dummy for more than 50% privately owned, dummy for firm-level collective agreement and region where the firm is located (Brussels, Flanders or Wallonia). <sup>f</sup> 35 occupation dummies. <sup>g</sup> 64 sector dummies. <sup>h</sup> 17,990 firm dummies. <sup>i</sup> The null hypothesis of the test specifies that the estimates are not statistically different from each other. The category 'Others' is also included in the regressions, but its estimates are not portrayed in this table. Source: STATBEL, 1999-2016.

By contrast, important differences between male workers born in developed countries and female workers can be pinpointed, regardless of their origin and generation. More precisely, our gender-interacted estimates in column (1) show that the overall wage gaps are as follows: 14.9% for female workers born in developed countries, 30.2% for F-G female immigrants born in developing countries, and 25.7% for S-G female immigrants from developing countries. Consequently, these findings highlight the existence of a significant double overall wage gap for F-G and S-G female immigrants from developing countries (see the test for equality of coefficients at the bottom of column (1)).

However, the sizeable overall wage penalties experienced by female workers, regardless of their origin and generation, may in part be explained by some disadvantages in their statistical profiles (see Appendix 4 for descriptive statistics by origin, generation and gender). In line with this premise, we observe that female workers are strongly over-represented in part-time jobs compared to male workers, regardless of their origin and generation. Similarly, female workers are more concentrated in clerical support, service and sales jobs, and elementary occupations (i.e. occupations characterized by a high proportion of low-paying jobs) than male workers, whatever their origin and generation.

With this in mind, we have re-estimated our model, including all covariates and fixed effects. Results are reported in column (2) of Table 5. As expected, our gender-interacted estimates now indicate that the adjusted wage gaps are as follows: 8.1% for female workers born in developed countries, 8.6% for F-G female immigrants born in developing countries, and 7.6% for S-G female immigrants from developing countries. Furthermore, if we consider the tests for equality of coefficients at the bottom of column (2), we can conclude that: i) S-G female immigrants from developing countries outperform their F-G same-gender counterparts; ii) F-G female immigrants born in developing countries experience a double adjusted wage gap, albeit relatively small (i.e. compared to the adjusted gender wage gap experienced by female workers born in developed countries, a significant difference of 0.5 percentage points is estimated); and iii) there is no evidence of a double adjusted wage gap for S-G female immigrants from developing countries.

#### **5.4. Wage distribution**

In order to estimate overall wage gaps beyond the mean, identify the contribution of observables to these gaps, and provide a more advanced econometric analysis of gender roles, we conduct reweighted RIF-OB decompositions for male and female workers, separately.<sup>74</sup> In this subsection, reweighted RIF-OB decompositions represent same-gender wage gaps between workers born in developed countries and counterfactual workers from developing countries across two generations. Tables 6 and 7 show the unconditional quartile coefficients of

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<sup>74</sup> The limits of STATA, i.e. the econometric software used for our estimations, do not allow us to include thousands of firm dummies in our reweighted RIF-OB decompositions. Therefore, we were constrained to work with sector fixed effects (i.e. 65 sector dummies) in this part of our empirical analysis. However, it should be noted that the estimates of our benchmark specification using sector fixed effects are very similar to those obtained using firm fixed effects (see columns (4) and (5) of Table 3).

reweighted RIF-OB decompositions at the lower, median and upper quartiles for male and female workers, respectively.<sup>75</sup> In addition, complete quantile functions are reported as graphs in Figures 1 and 2.<sup>76</sup>

Our unconditional quantile coefficients in column (1) of Tables 6 and 7 first show that the overall wage gaps between male (female) workers born in developed countries and F-G male (female) immigrants born in developing countries increase substantially along the wage distribution. A similar pattern, albeit to a lower extent, is identified for the evolution of the overall wage gaps for S-G male immigrants from developing countries along the wage distribution. By contrast, the overall wage gaps for S-G female immigrants from developing countries appear to be almost constant along the wage distribution. Moreover, important differences can be highlighted when comparing overall wage gaps across two generations. More precisely, at the lower quartile, the overall wage gaps for S-G female and male immigrants from developing countries remain quite similar to those for their F-G same-gender peers. By contrast, at the median and upper quartiles, the overall wage gaps for S-G female and male immigrants from developing countries are less pronounced than those for their F-G same-gender peers.

Moreover, our reweighted RIF-OB decompositions in column (2) of Tables 6 and 7 show that the overall wage gaps for F-G female born in developing countries and their S-G female and male peers are fully explained by compositional effects (i.e. worker, employment and firm characteristics) along the wage distribution. Regarding the overall wage gaps for F-G male immigrants born in developing countries, although they are mainly driven by compositional effects, a negative wage structure effect (i.e. an adjusted wage gap) can also be pinpointed (see column (9) of Table 6). We also find that this wage structure effect increases while ascending the wage distribution (see Figure 1). In this regard, although we cannot ultimately assert whether wage structure effects are caused by wage discrimination or potential differences in unobservable characteristics, the large number of covariates included in our reweighted RIF-OB decompositions, which further create counterfactual workers from developing countries, enable us to feel confident to attribute these effects at least partially to wage discrimination.

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<sup>75</sup> Reweighted RIF-OB decompositions produce two errors to inform about the quality of the estimates along the wage distribution. The reweighting errors provide information on the quality of the counterfactual distributions' identification (see columns (8) of Tables 6 and 7). The specification errors provide information on the quality of the RIF regressions (see columns (10) of Tables 6 and 7).

<sup>76</sup> Insofar as can be ascertained, insignificant or small wage structure effects at the quantiles 10 and 20 can be taken as evidence of sticky floors (i.e. minimum wages).

**Table 6: Reweighted RIF-OB decompositions for MALE workers - unconditional quartile coefficients**

Reference group: male workers born in developed countries		Overall wage gap	Total composition effect (Quantity effects) <sup>a</sup>						Total wage structure effect (Price effects) <sup>c</sup>		
			Total = (I) + (II)	Pure composition effect (I)					Specification error (II)	Pure wage structure effect	Reweighting error
				Age	Tenure	Education	Household	Employment and firm <sup>b</sup>			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<b>Counterfactual group: male workers from developing countries<sup>e</sup></b>											
25 <sup>th</sup> percentile	First generation	-0.119*** (0.001)	-0.089*** (0.001)	0.007*** (0.000)	-0.020*** (0.000)	-0.017*** (0.000)	-0.001*** (0.000)	-0.059*** (0.001)	0.002 (0.001)	-0.031*** (0.001)	0.001 (0.000)
	Second generation	-0.116*** (0.002)	-0.124*** (0.001)	-0.071*** (0.001)	-0.027*** (0.000)	-0.003*** (0.000)	-0.002*** (0.000)	-0.023*** (0.001)	0.002 (0.001)	0.008*** (0.002)	0.001 (0.000)
50 <sup>th</sup> percentile	First generation	-0.156*** (0.001)	-0.110*** (0.001)	0.004*** (0.000)	-0.024*** (0.000)	-0.027*** (0.000)	-0.001*** (0.000)	-0.073*** (0.001)	0.010*** (0.001)	-0.046*** (0.001)	0.001 (0.000)
	Second generation	-0.118*** (0.002)	-0.127*** (0.001)	-0.072*** (0.001)	-0.031*** (0.000)	-0.005*** (0.000)	-0.001*** (0.000)	-0.017*** (0.001)	-0.001 (0.001)	0.008*** (0.002)	0.000 (0.000)
75 <sup>th</sup> percentile	First generation	-0.245*** (0.002)	-0.188*** (0.001)	-0.000 (0.000)	-0.022*** (0.000)	-0.047*** (0.001)	0.001* (0.000)	-0.117*** (0.001)	-0.002 (0.001)	-0.058*** (0.002)	0.000 (0.000)
	Second generation	-0.178*** (0.003)	-0.178*** (0.002)	-0.101*** (0.001)	-0.028*** (0.001)	-0.010*** (0.001)	0.001*** (0.000)	-0.040*** (0.002)	0.000 (0.001)	0.001*** (0.000)	-0.001 (0.002)

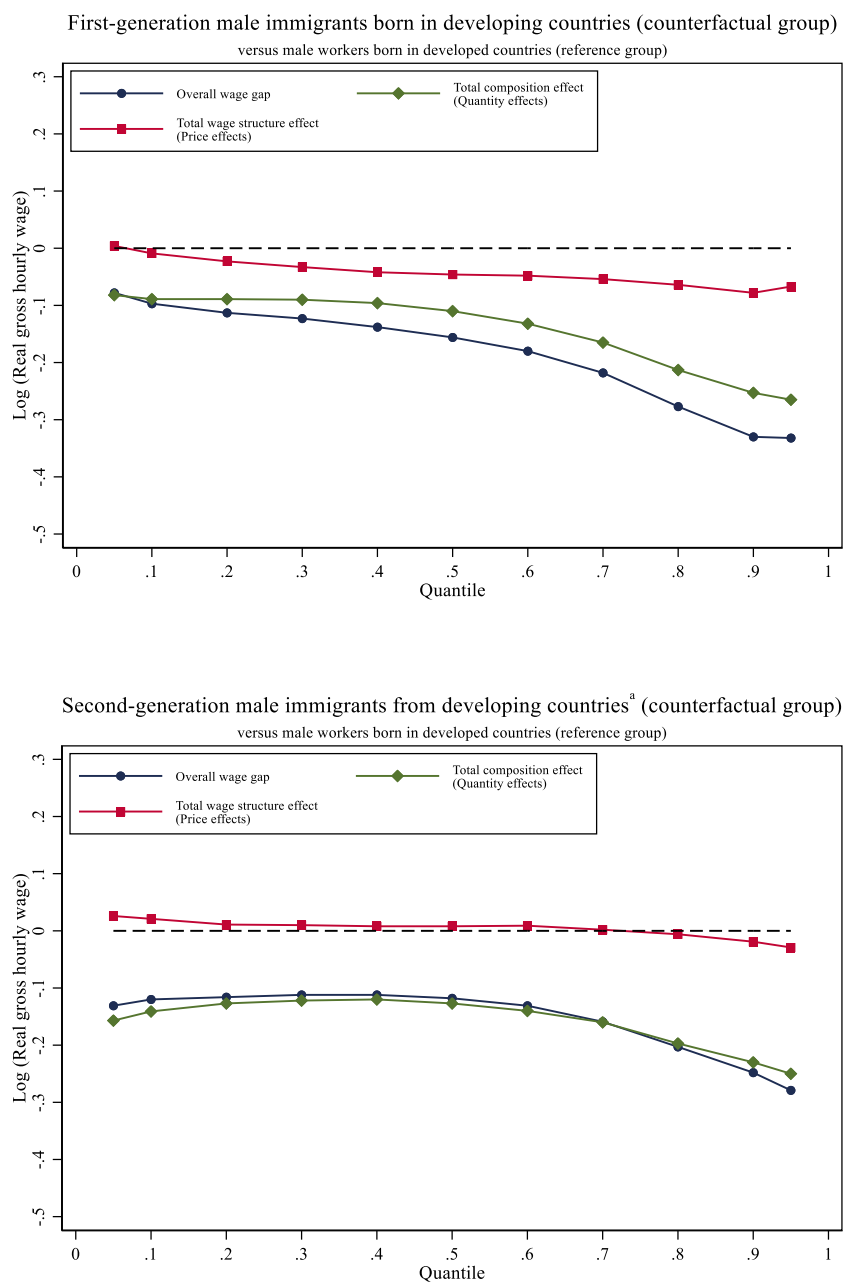
Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Bootstrap standard errors are in parentheses. Sample covers workers aged 15-64. <sup>a</sup> Total composition effect is the sum of a pure composition effect and a specification error. The pure composition effect reflects the part of the overall wage gap attributed to differences in observable characteristics. <sup>b</sup> The pure composition effect of each variable included in 'Employment and firm' can be found in Appendix 5.1. <sup>c</sup> Total wage structure effect is the sum of a pure wage structure effect and a specification error. The pure wage structure effect refers to wage differentials between the reference group and the counterfactual group. <sup>d</sup> The detailed composition of the pure wage structure effect is available upon request. <sup>e</sup> Second-generation workers' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. Source: STATBEL; 1999-2016

**Table 7: Reweighted RIF-OB decompositions for FEMALE workers - unconditional quartile coefficients**

Reference group: female workers born in developed countries		Overall wage gap	Total composition effect (Quantity effects) <sup>a</sup>							Total wage structure effect (Price effects) <sup>c</sup>		
			Total = (I) + (II)	Pure composition effect (I)						Specification error (II)	Pure wage structure effect <sup>d</sup>	Reweighting error
				Age	Tenure	Education	Household	Employment and firm <sup>b</sup>				
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
<b>Counterfactual group: female workers from developing countries<sup>e</sup></b>												
25 <sup>th</sup> percentile	First generation	-0.088*** (0.002)	-0.089*** (0.001)	0.006*** (0.000)	-0.023*** (0.000)	-0.022*** (0.000)	-0.001* (0.000)	-0.101*** (0.002)	0.052*** (0.001)	0.002 (0.013)	-0.001 (0.001)	
	Second generation	-0.087*** (0.003)	-0.092*** (0.002)	-0.057*** (0.001)	-0.024*** (0.000)	0.000* (0.000)	-0.002*** (0.000)	-0.019*** (0.001)	0.009*** (0.001)	0.005*** (0.000)	0.000 (0.002)	
50 <sup>th</sup> percentile	First generation	-0.162*** (0.002)	-0.156*** (0.002)	0.006*** (0.000)	-0.031*** (0.000)	-0.027*** (0.001)	0.000 (0.000)	-0.108*** (0.002)	0.005*** (0.002)	-0.006 (0.015)	-0.001 (0.002)	
	Second generation	-0.110*** (0.003)	-0.112*** (0.002)	-0.064*** (0.001)	-0.033*** (0.001)	0.000 (0.001)	-0.001*** (0.000)	-0.006*** (0.001)	-0.008*** (0.001)	0.001 (0.002)	0.000 (0.000)	
75 <sup>th</sup> percentile	First generation	-0.225*** (0.004)	-0.200*** (0.002)	0.005*** (0.000)	-0.030*** (0.001)	-0.046*** (0.001)	0.002*** (0.000)	-0.099*** (0.002)	-0.032*** (0.002)	-0.024 (0.020)	-0.000 (0.003)	
	Second generation	-0.116*** (0.005)	-0.117*** (0.003)	-0.079*** (0.001)	-0.031*** (0.001)	0.000 (0.001)	0.001*** (0.000)	0.007*** (0.002)	-0.015*** (0.001)	-0.001 (0.004)	-0.000** (0.000)	

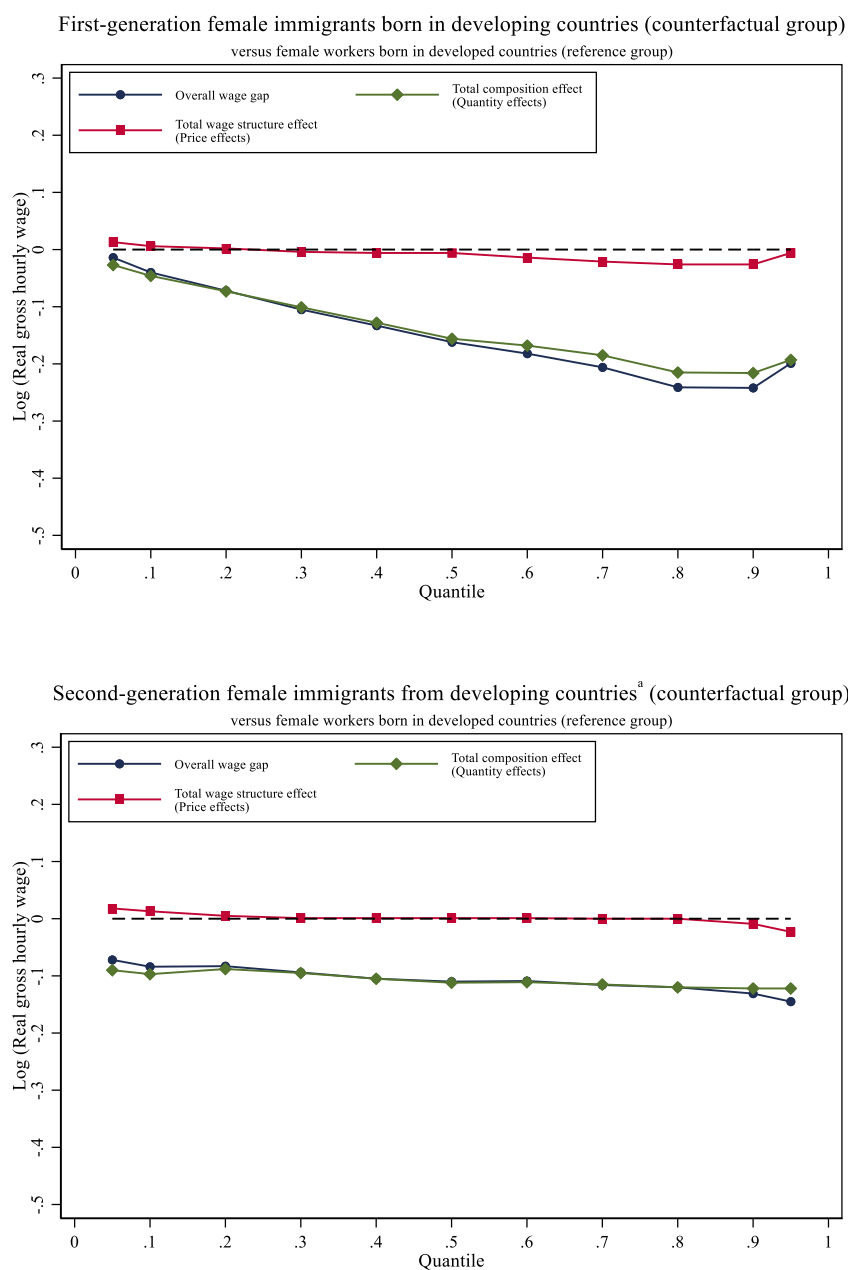
Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Bootstrap standard errors are in parentheses. Sample covers workers aged 15-64. <sup>a</sup> Total composition effect is the sum of a pure composition effect and a specification error. The pure composition effect reflects the part of the overall wage gap attributed to differences in observable characteristics. <sup>b</sup> The pure composition effect of each variable included in 'Employment and Workplace' can be found in Appendix 5.2. <sup>c</sup> Total wage structure effect is the sum of a pure wage structure effect and a specification error. The pure wage structure effect refers to wage differentials between the reference group and the counterfactual group. <sup>d</sup> The detailed composition of the pure wage structure effect is available upon request. <sup>e</sup> Second-generation workers' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. Source: STATBEL; 1999-2016

**Figure 1: Reweighted RIF-OB decompositions: complete unconditional quantile coefficients for male workers**



Notes: Sample covers workers aged 15-64. <sup>a</sup> S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. All the unconditional quantile coefficients associated with overall wage gaps and total composition effects for male immigrants from developing countries are statistically significant at the 1% level. For F-G male immigrants born in developing countries, while all the unconditional quantile coefficients associated with total wage structure effects between quantiles 10 and 20 are not statistically significant at 1%, 5% and 10% levels, those between quantiles 30 and 90 are statistically significant at the 1% level. For S-G male immigrants from developing countries, all the unconditional quantile coefficients associated with total wage structure effects are not statistically significant at 1%, 5% and 10% levels. Source: STATBEL, 1999-2016.

**Figure 2: Reweighted RIF-OB decompositions: complete unconditional quantile coefficients for female workers**



*Notes:* Sample covers workers aged 15-64. <sup>a</sup> S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. All the unconditional quantile coefficients associated with the overall wage gaps and total composition effects for F-G female immigrants born in developing countries and their S-G same-gender counterparts are statistically significant at the 1% level. All the unconditional quantile coefficients associated with the total wage structure effects for F-G female immigrants born in developing countries and their S-G same-gender counterparts are not statistically significant at 1%, 5% and 10% levels. Source: STATBEL, 1999-2016.

Given that compositional effects explain all (or most) of the gaps mentioned above, the question: “How do worker, employment and firm characteristics shape the overall wage gaps for immigrants from developing countries across two generations?”, requires further investigation. Regarding worker characteristics, our reweighted RIF-OB decompositions in columns (3)-(6) of Tables 6 and 7 show that along the wage distribution, the overall wage gaps for F-G female and male immigrants born in developing countries are very weakly explained by their age. In contrast, their lower education and tenure play a significant role. At the upper end of the wage distribution, in particular, we observe that F-G female and male immigrants born in developing countries are considerably penalized by their lower education attainment compared to same-gender workers born in developed countries.

As regards employment and firm characteristics (e.g. occupation, type of contract, part-time work and sectors of activity), we find that they also account for a substantial part of overall wage gaps experienced by F-G female and male immigrants born in developing countries (see column (7) of Tables 5 and 6). Indeed, columns (6) and (8) of appendices 5.1 and 5.2 suggest that, throughout the wage distribution, the concentration of F-G immigrants born in developing countries, both women and men, in low-paying occupations and (to a lesser extent) low-paying sectors explains a significant proportion of the overall wage gaps they encounter (i.e. occupational/sectoral segregation).

Turning to S-G female and male immigrants from developing countries, we find that along the wage distribution, their lower tenure and, above all, their younger age explain most of their overall wage gaps (see columns (3)-(6) in Tables 6 and 7). In contrast, education appears to play a marginal role in the explanation of these wage gaps (especially for S-G female immigrants), which is consistent with our descriptive statistics showing that S-G male immigrants (and even more so female immigrants) from developing countries have similar levels of education to male (female) workers from developed countries.

In addition, our reweighted RIF-OB decompositions in columns (6)-(7) of Appendixes 5.1 and 5.2 show that along the wage distribution, occupational/sectoral characteristics also contribute – albeit modestly and more among men than women - to the overall wage gaps for S-G immigrants from developing countries. In other words, compared to their same-gender F-G peers, S-G female and male immigrants from developing countries have better employment characteristics and are much less concentrated in low-paying sectors and occupations. However,

compared to same-gender workers born in developed countries, S-G male and (to a lesser extent) female immigrants from developing countries still experience some occupational and sectoral segregation. In principle, their younger age and lower tenure with respect to their counterparts born in developed countries may explain this remaining segregation. S-G could indeed experience occupational and sectoral upgrading when they get older. However, we cannot rule out a status quo scenario throughout their careers, namely a situation where S-G immigrants find it difficult to move out of lower-paid professions and sectors despite their greater professional experience. In future research, it would be interesting to test which of these scenarios is the most verified on the basis of longitudinal data.

## **6. Conclusion**

In a developed world marked by demographic ageing, the labour market integration of immigrants born in developing countries and their descendants plays a key role in ensuring the sustainability of social security systems (e.g. healthcare, pensions and unemployment benefits). Indeed, good results on the labour market for the immigrant population go hand in hand with a positive net contribution to economic growth and the tax base. (Christl et al., 2021; OECD, 2021). In this respect, although the access to employment of immigrants from developing countries across two generations has been well-documented at the international level (e.g. Belzil and Poinas, 2010; Midtbøen, 2016; OECD, 2020a; Piton and Rycx, 2021), the intergenerational evolution of their wages has received less attention due, among other things, to data availability (e.g. Athari et al., 2019; Card et al., 2000; Duncan and Trejo, 2018). Moreover, it should be noted that most evidence on immigrant-native wage gaps across generations is characterized by sampling and econometric limitations: small samples, short periods, a limited number of control variables and/or standard OLS regressions (mainly computed at the mean). Therefore, using a matched employer-employee database of 1.3 million observations over the period 1999-2016 for the Belgian private sector and two econometric techniques (i.e. weighted multilevel log-linear regressions and reweighted RIF-OB decompositions), we contribute to the existing literature with a comprehensive assessment of the wages of immigrants from developing countries over two generations.

Our weighted multilevel log-linear estimates suggest that the wages of S-G immigrants from developing countries are somewhat higher than those of their F-G peers. However, the overall wage gaps between workers born in developed countries and workers from developing

countries remain highly persistent across two generations (17.1% for F-G immigrants and 14.4% for S-G immigrants). As overall wage gaps can also be explained by factors other than workers' origin, we include a wide range of covariates (e.g. age, tenure, education, type of contract, occupation and firm fixed effects) in our regressions. We find that the adjusted wage gap for F-G immigrants born in developing countries is 2.9%, whereas there is no evidence of an adjusted wage gap for their S-G peers.

The estimates associated with F-G immigrants born in developing countries remain largely similar when we divide them by geographical origin. However, it is worth noting that S-G immigrants from Sub-Saharan Africa and non-EU Eastern Europe face lower overall wage gaps than their S-G peers from other developing regions. Similarly, S-G immigrants from emerging and developing Asia, Latin America and the Caribbean experience adjusted wage gaps, while S-G immigrants from other developing regions perform on par with workers born in developed countries. Moreover, after including an interaction between origin and gender in our regressions, we find that F-G immigrants born in developing countries and their S-G same-gender peers receive considerably lower wages than female workers born in developed countries, who experience a gender wage gap with respect to their male counterparts (i.e. evidence of a double overall wage gap for female immigrants from developing countries across two generations). However, controlling for covariates, the adjusted wage gaps for F-G immigrants born in developing countries and their S-G same-gender peers are broadly comparable to those for female workers born in developed countries (i.e. only evidence of an adjusted gender wage gap, regardless of female workers' origin).

When it comes to analysing the wages of immigrants beyond the mean, the unconditional quantile coefficients of our reweighted RIF-OB approach suggest that the overall wage gaps for F-G female and male immigrants born in developing countries and their S-G male peers increase along the wage distribution. In contrast, the overall wage gap for S-G female immigrants from developing countries remains relatively constant along the wage distribution. Furthermore, our reweighted RIF-OB decompositions show that along the wage distribution, the overall wage gaps for F-G male (female) immigrants born in developing countries are mainly (wholly) explained by their lower levels of education and tenure and their overconcentration in low-paying occupations and (to a lesser extent) low-paying sectors. We also find that the overall wage gap for F-G male immigrants born in developing countries is

partly explained by a wage structure effect (i.e. an adjusted wage gap), which increases along the wage distribution.

Turning to S-G female and male immigrants from developing countries, our reweighted RIF-OB decompositions show that along the wage distribution, their overall wage gaps are essentially explained by their younger age and (to a lesser extent) lower tenure in comparison to their counterparts from developed countries. Occupational/sectoral characteristics also contribute - albeit modestly and more so for men than women - to explaining the overall wage gaps experienced by S-G immigrants from developing countries. That said, it should be stressed that in the decomposition of overall wage gaps, the contribution of sectoral and particularly occupational segregation is clearly weaker for S-G immigrants from developing countries than for their F-G peers. Finally, along the wage distribution, we find no evidence of a significant (and economically meaningful) wage structure effect for S-G female and male immigrants from developing countries.

Overall, our paper sheds light on the importance of the legacy of immigration in explaining persistent overall wage gaps for immigrants from developing countries across two generations. However, we also show that *ceteris paribus*, within a firm, although F-G immigrants born in developing countries are paid somewhat less than workers born in developed countries, this is no longer the case for their S-G peers (i.e. no adjusted wage gap). Indeed, the overall wage gaps for F-G immigrants born in developing countries (and their S-G peers) are largely (wholly) explained by compositional effects. This said, it should be recalled that some compositional effects often reflect pre-labour market inequalities (e.g. educational attainment gaps or additional difficulties in accessing the primary labour market related to origin) and/or occupational/sectoral segregation. Hence, these integration issues should not be overlooked when designing policies aimed at tackling wage inequalities between natives and immigrants.

## Chapter 3

# Immigrant overeducation across generations: The role of gender and part-time work<sup>77</sup>

### Abstract

A large body of literature shows that first-generation immigrants born in developing countries experience a higher likelihood of being overeducated than natives (i.e. immigrant overeducation). However, evidence is remarkably scarce when it comes to the overeducation of second-generation immigrants. Using a matched employer-employee database for Belgium over the period 1999-2016 and generalized ordered logit regressions, we contribute to the literature with one of the first studies on the intergenerational nexus between overeducation and origin among tertiary-educated workers. We show that immigrant overeducation disappears across two generations when workers work full-time. However, immigrant overeducation is a persistent intergenerational phenomenon when workers work part-time. Our gender-interacted estimates endorse these findings for female and male immigrants.

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<sup>77</sup> Chapter 3, co-authored with Rycx F. and Volral M, is under review in an international peer-reviewed journal. STATA do-files that support the empirical findings of this paper are available on request. The data used in this paper are available from Statistics Belgium. However, restrictions may apply to the availability of these data, as confidentiality agreements and licenses must be signed with Statistics Belgium. The STATA do-files supporting this paper's findings are available on request.

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## 1. Introduction

According to Eurostat (2023b), the employment rate of foreign-born people in the European Union (EU) was 65.9% in 2021, around 5% points lower than that of native-born people (70.7%).<sup>78</sup> Difficulties in accessing the labour market also extend to the descendants of immigrants, whose employment rate was 65.3%. Zooming in on the EU employed population, several studies show that the wages of immigrants are lower than those of natives, albeit the extent of this wage gap significantly depends on immigrants' origin (e.g. Athari et al., 2019 for France; Hammarstedt and Palme, 2012 for Sweden; Pineda-Hernández et al., 2022a for Belgium). More precisely, while immigrants from developed countries earn similar wages to natives across two generations, immigrants from developing countries face persistent intergenerational wage inequalities. However, regarding the employment conditions of immigrants, intergenerational studies are scarce (e.g. Belfi et al., 2022; Belzil and Poinas, 2010), especially in the context of overeducation (i.e. the condition of having a higher level of education than that required to perform a specific job).

Moreover, it is of general interest to investigate whether origin contributes to the likelihood of being overeducated for a worker (i.e. immigrant overeducation) and whether this phenomenon holds across generations, as overeducation can have negative micro and macroeconomic consequences. In essence, overeducation can lead to: i) wage penalties and lower job satisfaction for overeducated workers because they are not paid according to their level of education, ii) lower productivity for firms due to the underutilisation of overeducated workers' skills<sup>79</sup>, higher labour turnover and an increase in absenteeism, iii) higher inequality and poverty for societies because overeducated workers may replace less-qualified workers, pushing them into low-paying occupations or unemployment; and iv) lower economic growth for countries as a result of funding non-productive education and misallocation of human capital (Brunello and Wruuck, 2019; Davia et al., 2017; McGuinness, 2006; Nielsen, 2011; Nugent, 2022).

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<sup>78</sup> Unless mentioned otherwise, Chapter 3 henceforth uses the words i) 'first-generation immigrants' and 'foreign-born people' for people born abroad; ii) 'second-generation immigrants', 'children of immigrants' and 'descendants of immigrants' for people born in the host country with at least one foreign-born parent; iii) 'immigrants' for first- and second-generation immigrants; and iv) 'natives' for people born in the host country with both parents born in the host country.

<sup>79</sup> Jacobs et al. (2022a) find that although firms employing more overeducated workers should expect to pay higher wages, these workers positively impact firms' productivity. However, it is still possible to assume that overeducated workers would be more productive and earn more if they were employed in occupations where their skills would be correctly used.

The nexus between origin and overeducation can be established through different underlying mechanisms. First, the human capital theory specifies that first-generation (F-G) immigrants face a disadvantageous position in the host country's labour market, as their foreign education and experience are unlikely to be perfectly transferred across borders (e.g. educational qualifications acquired in developing countries are often non-recognized in developed countries) (Basilio et al., 2017). Second, the screening theory underlines the poor signal that a foreign diploma may send to employers (i.e. employers tend to undervalue schooling and language capabilities acquired in developing countries) (Chiswick and Miller, 2009; Zwysen and Demireva, 2018). Third, the job search theory states that F-G immigrants may remain clustered in low-paying occupations (i.e. jobs that require a low level of education) due to their insufficient knowledge of the functioning of the host country's labour market (Akkaymak, 2017). Several empirical studies accord with these theories. In sum, they show that: i) F-G immigrants are more likely to be overeducated than natives (i.e. evidence of immigrant overeducation) (e.g. Jacobs et al., 2021; Lindley, 2009; Nielsen, 2011; Wen and Maani, 2018); ii) F-G immigrants experience a higher probability of state dependence in overeducation than natives<sup>80</sup> (e.g. Joonas et al., 2014; Kalfa and Piracha, 2017); and iii) the negative effect of overeducation on earnings is more substantial for F-G immigrants than for natives (e.g. Jacobs et al., 2022b; Maani and Wen, 2021; Nielsen, 2011).

However, the abovementioned theoretical explanations would hardly apply to the children of immigrants. Indeed, the classical assimilation theory stipulates that since second-generation (S-G) immigrants are born, educated and socialised from childhood to adulthood in the host country as natives, they should perform better than their F-G peers and be on par with natives (Alba et al., 2011; Park and Myers, 2010). In other words, as S-G immigrants possess human and social capital linked to the host country's labour market, their likelihood of being overeducated should be similar to that of natives (i.e. immigrant overeducation should disappear across two generations). However, the segmented-assimilation theory sees this as a very optimistic assumption and instead suggests that S-G immigrants may still have to deal with marginalisation and discrimination due to the parental transmission of ethnic traits (e.g. religiosity, skin colour and patronymic) and social characteristics (e.g. low-income families and concentration in immigrant-dense neighbourhoods) (Blau et al., 2013; OECD, 2017b; Phalet and Heath, 2010). OECD (2020c) further highlights that S-G immigrants may not wholly

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<sup>80</sup> By state dependence in overeducation, we mean that being overeducated for a worker in the previous period increases his/her likelihood of being overeducated in the current period.

benefit from the host country's education due to school segregation and less parental support in their learning process.<sup>81</sup> Therefore, differences in employment conditions between natives and S-G immigrants cannot be completely ruled out.

Furthermore, immigrant overeducation could be a persistent intergenerational phenomenon because: i) employers can make recruitment decisions based on imperfect information and ethnic stereotypes (i.e. statistical discrimination), ii) employers can have ethnic preferences for certain occupations, regardless of observed abilities and qualifications (i.e. taste-based discrimination), and iii) employers can take advantage of the barriers that immigrants face in accessing the primary labour market to hire them for jobs that do not match their level of education (e.g. monopsonistic discrimination<sup>82</sup>) (Becker, 1957; Zschirnt and Ruedin, 2016).

As far as we know, only a few empirical papers have explicitly considered S-G immigrants in the relationship between overeducation and origin. This is understandable because databases that examine this research topic rarely contain information on the country of birth of workers' parents. Using population data for Sweden in 2007 and logit regressions, Dahlstedt (2015) shows that the likelihood of being overeducated for S-G female immigrants is similar to that of female natives. In contrast, there is still an overeducation gap between S-G male immigrants and male natives. Using register data for Norway in 2014 and OLS regressions, Larsen et al. (2018) find that S-G female and male immigrants are just as likely to be overeducated as same-gender natives, thus performing better than their F-G same-gender counterparts. Using the Labour Force Survey for Spain in the years 2008 and 2014 and logit regressions, Fernández-Reino et al. (2018) find that while immigrant overeducation significantly reduces across two generations among male workers, S-G female immigrants reverse the overeducation gap that their F-G same-gender peers experience. Using survey data for the Netherlands over the period 2006-2014 and multinomial logit regressions, Falcke et al. (2020) show that S-G female and male immigrants from non-Western countries (i.e. emerging and developing economies) are more likely to be overeducated than same-gender natives.

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<sup>81</sup> F-G immigrants tend to be less educated, less proficient in the host country's language and less informed about how the school system works, which reduces the degree of support in their children's learning.

<sup>82</sup> Monopsonistic discrimination stipulates that in the context of a single buyer of the labour force, the more inelastic the labour supply, the lower wages relative to productivity (Barth and Dale-Olsen, 2009). This assumption can also be extrapolated to employment conditions. For instance, if the immigrant labour supply is more inelastic than the native labour supply, immigrants would be more likely than natives to accept low-paying jobs that do not correspond to their level of education.

Although these studies are the first to bring light to the overeducation of S-G immigrants, we believe there is room for significant improvement in the empirical strategy of this research topic. First, most evidence is based on short or unbalanced data, reducing the results' external validity and time consistency. Second, most studies use econometric regressions that may lead to biased estimations. For instance, binary non-linear models (e.g. logit and probit regressions) are unsuited for analysing educational mismatches, as a worker can be undereducated<sup>83</sup>, adequately educated or overeducated. Similarly, results based on OLS regressions may face under- or over-estimation issues, as these regressions impose a linear relationship between origin and overeducation and do not guarantee that every predicted probability stands between 0 and 1. Therefore, multiple-choice non-linear models (e.g. ordered or multinomial logit regressions) must be used to avoid misspecification issues. Third, none of the existing studies uses interactions between origin and gender in their empirical strategy to explore a potential double penalty for female immigrants across generations (i.e. being penalised due to gender and foreign background).

Before delving into the details of our research, it is worth noting that we focus exclusively on tertiary-educated workers because they are, *per se*, individuals who can be reasonably at risk of being overeducated. Indeed, considering all individuals in a study on overeducation could lead to misleading conclusions, as workers holding at most a secondary diploma are much less likely to be overeducated. Several papers follow a similar strategy (e.g. Nielsen, 2011; Nugent, 2022; Shi et al., 2022). In addition, we also devote particular attention to immigrants from developing countries<sup>84</sup>, as a large body of literature shows that F-G immigrants born in developed countries and their S-G counterparts appear not to represent a significant integration concern for Western societies (e.g. Abramitzky et al., 2021; Algan et al., 2010; Fays et al., 2021).

Using a granular, matched employer-employee database for Belgium between 1999 and 2016, containing around 400,000 tertiary-educated workers, we aim to contribute to the literature with one of the first empirical studies on the intergenerational interplay between overeducation and origin. The novelty of our database is that it contains information on workers' country of birth

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<sup>83</sup> Workers are considered undereducated if their educational attainment is lower than that required for their job. Undereducation may notably result from periods of labour shortages (i.e. bottleneck vacancies) and technologically induced changes in job content and complexity.

<sup>84</sup> By 'developing countries', we mean either transition and developing countries listed in the United Nations' (2020) classification and/or emerging market and developing economies listed in the IMF's (2020) classification. See Appendix 1.

and that of their parents, which allows us to identify F-G immigrants and their S-G peers correctly.<sup>85</sup> The rich detail of our database also allows us to identify overeducation cases across more than 13,500 occupation-age-sector cells using a realized matches approach. Moreover, we also have access to the 2021 Labour Force Survey for Belgium and its ad-hoc module on ‘Migration and labour market’. This complementary data allows us to improve the quality of our paper using more detailed statistics. From an econometric viewpoint, as far as we know, our paper is the first to employ generalized ordered logit (GOLOGIT) regressions in the context of educational mismatches for the immigrant population. The main advantage of this econometric technique is that it relaxes the parallel regression assumption (i.e. the primary condition of an ordered logit regression) in the coefficients that do not meet it. The estimates of GOLOGIT regressions are also more parsimonious and interpretable than those of multinomial logit regressions (Williams, 2016; Williams and Quiroz, 2020).

Our empirical strategy starts with a GOLOGIT regression where, conditioning on a wide range of covariates (e.g. worker, employment and firm characteristics), we estimate the likelihood of being overeducated for immigrants from developing countries. Using a more fine-grained classification, we further explore how geographical origins<sup>86</sup> (e.g. the Maghreb, Sub-Saharan Africa and the Near and Middle East) shape the likelihood of being overeducated for immigrants from developing countries. We follow this approach as source-country characteristics at the individual level (e.g. patronymic, physical appearance, religion and cultural manners) and the macro level (e.g. economic and political stability, the quality of the education system and reasons for migration in the source country) can shape the integration of immigrants (Fleischmann and Dronkers, 2010; Levels and Dronkers, 2008). Several studies on immigrants’ employment and earnings outcomes accord with this premise (e.g. Athari et al., 2019; Lindley, 2009; Pineda-Hernández et al., 2022a; Piton and Rycx, 2021).

The contributions of our paper also extend to the analysis of two moderating variables (i.e. gender and part-time work) in the intergenerational relationship between overeducation and

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<sup>85</sup> Our empirical analysis is consistent with that used in the vast majority of existing (also more recent) studies documenting the labour market performance of immigrants from an intergenerational perspective (e.g., Algan et al., 2010; Athari et al., 2019; Duncan and Trejo, 2018; Gueye and Ceci-Renaud, 2022; Piton and Rycx, 2021). Indeed, we identify F-G immigrants and their S-G counterparts on the basis of workers' country of birth and that of their parents. In other words, like most previous studies, our analysis does not focus on clearly identified parent-child pairs.

<sup>86</sup> For the sake of accuracy in correctly classifying immigrants by geographical origin and economic development level, we constructed our geographical classification of countries based on the United Nations' (2020) classification and the IMF's (2020) classification. See Appendix 2.

origin. There are theoretical and empirical justifications for this additional analysis. Regarding the role of gender, when female workers become mothers, they may revisit their labour market trajectories or employment conditions to deal with motherhood and childcare (i.e. accepting jobs that do not often match their level of education but allow them to spend more time with their children) (Kifle et al., 2014; Petrongolo, 2019).<sup>87</sup> The European Commission (2019) further reveals that in the EU, tertiary-educated women are still underrepresented in professional or managerial occupations (i.e. potential overeducation issues). Recent papers underpin these statements as they find evidence of a gender overeducation gap in Europe (e.g. Nugent, 2022; Santiago-Vela and Mergener, 2022).

Moreover, traditional values and ethnic behaviour (e.g. family hierarchy and fertility and partner choices) can affect the working time decisions of F-G female immigrants, as they tend to be more involved in informal childcare and household production than natives (Baudin and Kondi, 2023; Ferrer and Mascella, 2022). Put differently, F-G female immigrants may find more difficulties than female natives in balancing their professional careers and ethnic identity (Blau et al., 2013; Fernández and Fogli, 2009), leading to a higher likelihood of being overeducated. There is also evidence that the influence of traditional values and ethnic norms extends to S-G female immigrants (Biegel et al., 2016; Maes et al., 2023; Noghanibehambari et al., 2022; Ng, 2023). Indeed, Jacobs et al. (2022c) point out that S-G female immigrants still face discrimination and prejudices in the workplace due to the construction of professional identities that match their migration background. However, these statements are not fully supported by the few papers that analyse the moderating role of gender in the relationship between origin and overeducation (e.g. Falckle et al., 2020; Jacobs et al., 2021; McGuinness and Byrne, 2015).

Regarding the role of part-time work, Davia et al. (2017) and Wen and Maani (2018) state that the level of education required for part-time jobs rarely corresponds to that of workers, as they may have chosen them for family reasons or personal preferences rather than career aspirations. Moreover, it could be argued that F-G immigrants may struggle to find full-time jobs due to poor human capital, imperfect transferability of qualifications or discrimination (Zschirnt and Ruedin, 2016), leading them to accept part-time jobs in a disadvantageous position (i.e. involuntary part-time work). Similarly, if employers present ethnic stereotypes or preferences

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<sup>87</sup> It is also very likely that some women leave the labour market because they cannot find a job that allows them to reconcile family and work.

for natives when recruiting full-time workers, an employment selection could also be applied to S-G immigrants. The findings of Fernández-Reino et al. (2018) and Green et al. (2007) go in this direction, suggesting that people with a migration background are more likely to be in a part-time job than natives. Therefore, since immigrants are more likely to be in part-time jobs, it is interesting to investigate whether immigrants working part-time also experience more educational mismatches than natives working part-time.

Last but not least, several papers show that women are more likely to work part-time than men (e.g. de Quinto et al., 2020; McIntosh et al., 2012; Piton, 2022). According to Fernández-Kranz et al. (2013) and Kifle et al. (2014), this overrepresentation of women in part-time jobs is mainly driven by mothers. Furthermore, Piton (2022) highlights that the size effect of motherhood on the likelihood of working part-time significantly depends on women's foreign background. Based on these premises, we also investigate how part-time work affects the likelihood of being overeducated for female and male immigrants from developing countries across two generations. To achieve this goal, we re-estimate our GOLOGIT regression using a three-way interaction (gender, part-time work and origin).

Our paper shows that, unlike their F-G peers, S-G immigrants from developing countries experience the same likelihood of being overeducated as natives (i.e. immigrant overeducation disappears across two generations). This finding applies to all geographical groups, with the exception of S-G immigrants from the Maghreb, who are somewhat more likely to be overeducated than natives. Our gender-interacted estimates suggest that F-G female immigrants born in developing countries face a double penalty in their likelihood of being overeducated due to their gender and migration background. In contrast, S-G female immigrants from developing countries perform on par with female natives (i.e. only evidence of a gender penalty in their likelihood of being overeducated). Moreover, part-time work is positively associated with immigrant overeducation, and this relationship largely persists across two generations. Finally, we find that immigrant overeducation is a persistent intergenerational issue when workers work part-time, irrespective of gender.

The remaining of our paper is structured in the following way. Section 2 documents the labour market performance of immigrants in Belgium. Our methodology is presented in Section 3. Section 4 describes the structure of our database. We present and discuss our empirical findings in Section 5. Section 6 concludes.

## 2. Belgian context

Belgium is one of the developed countries with the largest immigrant population. According to the 2021 Labour Force Survey, F-G immigrants accounted for 21.4% of the total population aged 20-64 in Belgium, while S-G immigrants represented 13.3%. Among this immigrant population, 44.7% had an EU background, while 55.3% came from non-EU countries (primarily immigrants from developing countries).<sup>88</sup> This demographic context makes Belgium an interesting case study to assess the labour market integration of immigrants across generations.

In the developed world, there is a large consensus regarding the positive role of education in boosting employment and wages (OECD, 2022). However, holding a tertiary diploma in Belgium seems more profitable for natives than for people with a migration background.<sup>89</sup> Indeed, tertiary-educated people born in developing countries experienced a sizeable immigrant-native employment gap in 2018, ranging between 17% and 30% points according to their geographical origin (FPS Employment and Unia, 2022). Moreover, several papers show that this integration issue extends to S-G immigrants (e.g. Corluy et al. 2015; De Cuyper et al. 2018). Piton and Rycx (2021) also find that F-G female immigrants born in developing countries and their same-gender descendants experience a double penalty in accessing the Belgian labour market.

Once in employment, F-G immigrants born in developing countries earn less than natives and face wage discrimination (e.g. Fays et al. 2021; Kampelmann and Rycx 2016; Grinza et al. 2020). From an intergenerational perspective, Pineda-Hernández et al. (2022a) show that the wages of S-G immigrants from developing countries are similar to those of their F-G peers, being substantially lower than those of natives. The authors also find evidence of a significant double penalty in the wages of female immigrants from developing countries across two generations. However, controlling for observables at the firm level, Pineda-Hernández et al. (2022a) show that the adjusted wage gap (e.g. wage discrimination) for immigrants from

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<sup>88</sup> It should be noted that the 2021 Labour Force Survey only allows us to identify if a worker's parent was born in an EU or non-EU country. Nevertheless, immigrants from non-EU developed countries (e.g. North America, Norway, Japan or Australia) represent less than 5% of the total immigrant population from non-EU countries in Belgium (FPS Employment and Unia, 2022). Therefore, immigrants from non-EU countries can be mainly considered as immigrants from developing countries in our statistics.

<sup>89</sup> For people who studied abroad, two possible scenarios exist for getting their diplomas recognised in Belgium. First, if the diploma was awarded in a European Economic Area (EEA) country after the implementation of the Bologna process in 1999, it can be directly processed by the Belgian higher education system (i.e. a fast-track procedure). Second, if the diploma was awarded in a non-EEA country, it must be analysed by an equivalency commission (i.e. a lengthy procedure).

developing countries disappears across two generations (from 2.7% to nil). In terms of employment conditions, Jacobs et al. (2021) show that F-G immigrants born in developing countries are much more likely to be overeducated than natives. Their estimates also suggest that F-G female immigrants born in developing countries face a similar likelihood of being overeducated as their F-G male peers (i.e. no evidence of a double penalty). Nevertheless, as far as we know, intergenerational migration issues related to overeducation remain unaddressed in Belgium.

### 3. Methodology

#### 3.1. Realized matches approach

Given the structure of our data (i.e. a matched employer-employee database), we follow a realized matches (RM) approach (also known as a statistical approach) to measure overeducation.<sup>90</sup> The RM approach uses workers' distribution of levels of education (ISCED: 7 categories) to calculate the modal value within each occupational group (i.e. workers' educational attainment that repeats the most in an occupation) (Kiker et al., 1997; Sellami et al., 2018; Verdugo and Verdugo, 1989).<sup>91</sup> Then, the modal value is used as a reference to identify educational mismatches (i.e. undereducation or overeducation).<sup>92</sup> For instance, a taxi driver is overeducated if she holds a bachelor's degree, whereas most taxi drivers only hold a secondary diploma.

However, it should be noted that the level of education required in an occupation may vary over workers' careers (i.e. age cohort effects) (Lindley, 2009). Put differently, as young workers' skills increase over time, the probability of being overeducated for old workers mechanically

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<sup>90</sup> Two other approaches are also available in the literature to measure overeducation: i) a job analysis approach that gauges overeducation by occupation based on analysts' criteria and ii) a worker self-assessment approach that uses surveys to ask workers if they consider or not themselves in a situation of overeducation given their current educational attainment (Pérez Rodriguez et al., 2020; Turmo-Garuz et al., 2019). However, our data do not contain the necessary information to implement them.

<sup>91</sup> Information on workers' educational attainment, available in 7 categories in our dataset, has been reported by firms' human resources departments (based on their registers). We converted that information into years of education, applying the following rule: i) primary education: 6 years of education; ii) lower secondary education: 9 years; iii) general, technical, and artistic upper secondary education: 12 years; iv) higher non-university education, short type (i.e. bachelor): 15 years; v) university and non-university education, long type (i.e. master): 17 years; vi) postgraduate education (i.e. advanced master): 18 years; and vii) doctoral education (i.e. PhD): 21 years. Since firms' human resources departments have provided information on workers' educational attainment, this might be somewhat underestimated for F-G immigrants who obtained their educational qualifications abroad. Therefore, the likelihood of being overeducated for F-G immigrants should be considered as a lower bound.

<sup>92</sup> In an RM approach, the mean by occupation can also be used as a reference. However, the mean is very likely to be influenced by outliers.

increases. In this regard, Voets (2022) shows that in the EU, while overeducation decreases over time for the youngest age groups, an opposite path is observed for the oldest ones. Moreover, the possibility of occupational skill upgrading or downgrading across sectors should also be considered (i.e. sector cohort effects). For instance, while the required level of education for a consultant in the real estate sector is a bachelor's degree, a master's degree is needed for the same occupation in the banking sector. Therefore, in order to minimize a potential bias related to these cohort effects, we sort workers by occupation (ISCO classification at a three-digit level), age group (five categories)<sup>93</sup> and sector (NACE classification at a two-digit level). Then, we identify educational mismatches using the modal value of the level of education in each occupation-age-sector cell.<sup>94</sup> Our granular employer-employee database allows us to identify 13,628 occupation-age-sector cells.<sup>95</sup> Therefore, the realized matches approach of our paper is notably more precise than those implemented in previous studies on immigrant overeducation.

### 3.2. Generalized ordered logit regressions

Ordered logit (OLOGIT) regressions and multinomial logit (MLOGIT) regressions are the two main econometric methods used in the literature to estimate educational mismatches (e.g. the probability of being under- or over-educated for a job). The choice between these two models depends on the possibility of establishing a ranking for the ordinal dependent variable. Initially, assuming an unequivocal order for educational mismatches (1 – undereducated, 2 – adequately educated, and 3 – overeducated), OLOGIT regressions seem to be the right choice. However, OLOGIT regressions depend on the parallel regression assumption (i.e. the effect of any explanatory variable is consistent or proportional across the different categories), which is often violated (Williams and Quiroz, 2020).<sup>96</sup> An alternative solution is to leverage MLOGIT regressions, which are well-suited to estimate likelihoods without the need to satisfy the parallel regression assumption. However, MLOGIT regressions depend on the assumption of independence of irrelevant alternatives (IIA) (i.e. the characteristics of one particular category

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<sup>93</sup> We consider the following age groups: 20-24, 25-29, 30-39, 40-49 and > 50.

<sup>94</sup> When several modes are identified within an occupation-age-sector cell, the minimum mode is used as the unique reference.

<sup>95</sup> The distribution of occupation-age-sector cells by size is as follows: 7.3% have less than ten observations, 38.7% have between 10 and 100 observations, 45.2% have between 101 and 1000 observations, and 8.8% have more than 1000 observations.

<sup>96</sup> The null hypothesis of the Brant test for parallel regression assumption specifies that the coefficients should be the same in each cumulative logistic regression. If the null hypothesis of this test is rejected, OLOGIT estimates can be highly misleading. Using our database, we reject the null hypothesis of the Brant test. The results of the test can be obtained on request.

do not impact the relative probabilities of choosing other categories), which is unlikely to hold in the analysis of educational mismatches.<sup>97</sup>

Against this background, Williams (2016) states that “*generalized ordered logit (GOLOGIT) regressions can fit estimates that are less restrictive than OLOGIT regressions, whose parallel regression assumption is often violated, but more parsimonious and interpretable than those fitted by MLOGIT regressions*”.<sup>98</sup> Moreover, GOLOGIT regressions present an additional advantage compared to other non-linear models. They allow the parallel regression assumption to be relaxed for estimates that do not satisfy it while imposing it on those that do (i.e. estimating partial proportional odds) (Williams, 2006). Therefore, we use GOLOGIT regressions to assess the intergenerational nexus between overeducation and origin among tertiary-educated workers in Belgium. Our benchmark GOLOGIT regression is written as follows:

$$P(Y_{it} > j) = g(\beta_j X) = \frac{\exp(\alpha_j + \sum_{k=1}^4 \beta_{jk} Origin_{itk} + \mathbf{z}_{it}^T \boldsymbol{\vartheta}_j + \mathbf{g}_{it}^T \boldsymbol{\lambda}_j + \mathbf{f}_{it}^T \boldsymbol{\xi}_j + \delta_{jt})}{1 + \{\exp(\alpha_j + \sum_{k=1}^4 \beta_{jk} Origin_{itk} + \mathbf{z}_{it}^T \boldsymbol{\vartheta}_j + \mathbf{g}_{it}^T \boldsymbol{\lambda}_j + \mathbf{f}_{it}^T \boldsymbol{\xi}_j + \delta_{jt})\}} \quad (1)$$

From equation (1), it can be established that the coefficients and fixed effects (summarised with the letter  $\phi$ ) associated with our regressors ( $X$ ) vary for each ordered category  $j$ .<sup>99</sup> Therefore, the probability that a worker  $i$  at time  $t$  within an occupation-age-sector cell will be under-, adequately or over-educated is respectively equal to:

$$P(Y_{it} = 1 = \text{undereducated}) = 1 - g(\phi_1 X)$$

$$P(Y_{it} = 2 = \text{adequately educated}) = g(\phi_1 X) - g(\phi_2 X)$$

$$P(Y_{it} = 3 = \text{overeducated}) = g(\phi_2 X)$$

As we are interested in the overeducation of workers, GOLOGIT regressions estimate the probability of being in the category 3 (i.e. overeducated) compared to being in a lower category

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<sup>97</sup> The null hypothesis of the Hausman test for the IIA assumption states that there is no systematic change in the coefficients if a category of the dependent variable is excluded from the model. If the null hypothesis of this test is rejected, the disturbances of the categories are not independent. Using our database, we reject the null hypothesis of the IIA assumption. The results of the test can be obtained on request.

<sup>98</sup> Case-specific multinomial probit (CSMP) regressions can also deal with the issues of OLOGIT regressions and MLOGIT regressions, as they relax both the IIA and the parallel regression assumptions. However, CSMP regressions are highly time-consuming, preventing them from generating simulated maximum likelihoods in granular and large databases. Indeed, the expected optimisation performance in CSMP models was never achieved using our database.

<sup>99</sup> In equation (1),  $\alpha_j$  represents the threshold parameter for each of the  $j$  ordered categories.

(i.e. under- or adequately educated). It should also be noted that we use the average marginal effects of GOLOGIT regressions to facilitate the interpretation of non-linear estimations.

In equation (1), our main explanatory variable is ‘ $Origin_{itk}$ ’<sup>100</sup>, which categorizes workers into five groups  $k$ : i) natives, i.e. workers born in Belgium with both parents born in Belgium (the reference group), ii) F-G immigrants born in developing countries<sup>101</sup>, iii) S-G immigrants from developing countries (i.e. workers born in Belgium with at least one parent born in a developing country)<sup>102</sup>, iv) immigrants from developed countries, excluding Belgian natives<sup>103</sup>, and v) others (i.e. workers born abroad with both parents born in Belgium)<sup>104</sup> (see Appendix 1 for a chart of developed and developing countries).

We also introduce an extensive range of covariates in our benchmark GOLOGIT regression to reduce a potential omitted variable bias. In order to facilitate the presentation of our covariates and their corresponding coefficients in equation (1), they are written as vectors in the following manner:

$$\begin{aligned} \underline{\mathbf{z}}_{it} &= (z_{it1}, \dots, z_{itM})^T & \underline{\boldsymbol{\vartheta}}_j &= (\vartheta_{j1}, \dots, \vartheta_{jM})^T \\ \underline{\mathbf{g}}_{it} &= (g_{it1}, \dots, g_{itL})^T & \underline{\boldsymbol{\lambda}}_j &= (\lambda_{j1}, \dots, \lambda_{jL})^T \\ \underline{\mathbf{f}}_{it} &= (f_{it1}, \dots, f_{itQ})^T & \underline{\boldsymbol{\xi}}_j &= (\xi_{j1}, \dots, \xi_{jQ})^T \end{aligned}$$

where  $\underline{\mathbf{z}}_{it}$  is a  $M \times 1$  vector of observations on worker characteristics (i.e. gender, tenure, squared tenure, level of tertiary education and type of household);  $\underline{\mathbf{g}}_{it}$  is a  $L \times 1$  vector of

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<sup>100</sup> We use parental country of birth instead of parents’ nationality or ethnicity to avoid ethnic attrition. Relying on nationality or ethnicity may lead to substantial classification errors (Kone, 2018).

<sup>101</sup> See footnote 84.

<sup>102</sup> Regarding S-G immigrants from developing countries, it should be noted that their origin has been firstly determined by the father’s country of birth, except if the father was born in Belgium and the mother in a developing country. In that case, the mother’s country of birth has been retained. This is a common approach in recent empirical studies covering the labour market outcomes of immigrants across generations (e.g. Corluy et al., 2015; Jacobs et al., 2022b; Jacobs et al., 2022c; Piton and Rycx, 2021).

<sup>103</sup> F-G immigrants born in developed countries and their descendants present similar labour market outcomes to those of Belgian natives (Fays et al., 2021; Jacobs et al., 2021; Piton and Rycx, 2021; Pineda-Hernandez et al., 2022). Therefore, as they do not represent an intergenerational integration issue for Belgium, we merge F-G immigrants born in developed countries and their descendants into a unique group.

<sup>104</sup> The category ‘others’ was created because workers born in developing countries with both parents born in developed countries earn more than any other group of origin (see Pineda-Hernández et al. (2022a)) and have better worker and employment characteristics than immigrants from developing countries (see Appendix 3). One might expect these workers to be the children of expatriates, who are generally highly educated and have a high socioeconomic level. Consequently, considering these workers as F-G immigrants born in developing countries could lead to misleading conclusions.

observations on employment characteristics (i.e. type of contract and dummies for part-time and overtime work);  $\mathbf{f}_{jt}$  is a  $Q \times 1$  vector that contains observations on the firm where the worker is employed (i.e. size of the firm, region where the firm is located and dummies for the existence of a firm-level collective agreement and the type of economic and financial control); and  $\delta_{jt}$  represents year fixed effects.

In a subsequent specification, we split immigrants from developing countries into six geographical groups: i) Sub-Saharan African countries, ii) the Maghreb countries, iii) the Near and Middle Eastern countries, iv) non-EU Eastern European countries, v) emerging and developing Asian countries, and vi) Latin American and Caribbean countries (see Appendix 2 for a list of countries by geographical region). We aim to assess the effects of more fine-grained characteristics associated with workers' region of birth or that of their parents (e.g. patronymic, physical appearance, type of religion, political stability of the region and quality of higher education systems in the destination countries) on the likelihood of being overeducated for immigrants from developing countries.

Moreover, we investigate the moderating role of gender and part-time work in the intergenerational relationship between overeducation and origin. To achieve this goal, we re-estimate equation (1) with an explanatory variable that varies according to origin and each moderator in the following way:

$$(Y_{it} > j) = g(\phi_j X) = \frac{\exp(\alpha_j + \sum_{k=1}^9 \beta_{jk} \text{gender\_origin}_{itk} + \mathbf{z}_{it}^T \boldsymbol{\vartheta}_j + \mathbf{g}_{it}^T \boldsymbol{\lambda}_j + \mathbf{f}_{it}^T \boldsymbol{\xi}_j + \delta_{jt})}{1 + \{\exp(\alpha_j + \sum_{k=1}^9 \beta_{jk} \text{gender\_origin}_{itk} + \mathbf{z}_{it}^T \boldsymbol{\vartheta}_j + \mathbf{g}_{it}^T \boldsymbol{\lambda}_j + \mathbf{f}_{it}^T \boldsymbol{\xi}_j + \delta_{jt})\}} \quad (2)$$

where ' $\text{gender\_origin}_{itk}$ ' is categorised as follows: i) male natives (reference group), ii) female natives, iii) F-G male immigrants born in developing countries, iv) F-G female immigrants born in developing countries, v) S-G male immigrants from developing countries, vi) S-G female immigrants from developing countries, vii) male immigrants from developed countries, viii) female immigrants from developed countries, ix) other male workers, and x) other female workers.

$$(Y_{it} > j) = g(\phi_j X) = \frac{\exp(\alpha_j + \sum_{k=1}^9 \beta_{jk} \text{origin\_part\_time}_{itk} + \mathbf{z}_{it}^T \boldsymbol{\vartheta}_j + \mathbf{g}_{it}^T \boldsymbol{\lambda}_j + \mathbf{f}_{it}^T \boldsymbol{\xi}_j + \delta_{jt})}{1 + \{\exp(\alpha_j + \sum_{k=1}^9 \beta_{jk} \text{origin\_part\_time}_{itk} + \mathbf{z}_{it}^T \boldsymbol{\vartheta}_j + \mathbf{g}_{it}^T \boldsymbol{\lambda}_j + \mathbf{f}_{it}^T \boldsymbol{\xi}_j + \delta_{jt})\}} \quad (3)$$

where ‘*origin\_part\_time<sub>itk</sub>*’ is categorised as follows: i) natives working full-time (reference group), ii) natives working part-time, iii) F-G immigrants born in developing countries working full-time, iv) F-G immigrants born in developing countries working part-time, v) S-G immigrants from developing countries working full-time, vi) S-G immigrants from developing countries working part-time, vii) immigrants from developed countries working full-time, viii) immigrants from developed countries working part-time, ix) other male workers working full-time, and x) other workers working part-time.

Finally, we simultaneously test the role of gender and part-time in the likelihood of being overeducated for immigrants from developing countries by re-estimating equation (1) with an explanatory variable that varies according to origin, gender and part-time work (i.e. a three-way interaction) as follows:

$$(Y_{it} > j) = g(\phi_j X) = \frac{\exp(\alpha_j + \sum_{k=1}^{17} \beta_{jk} interaction3_{itk} + \underline{z}_{it}^T \underline{\vartheta}_j + \underline{g}_{it}^T \underline{\lambda}_j + \underline{f}_{it}^T \underline{\xi}_j + \delta_{jt})}{1 + \{\exp(\alpha_j + \sum_{k=1}^{17} \beta_{jk} interaction3_{itk} + \underline{z}_{it}^T \underline{\vartheta}_j + \underline{g}_{it}^T \underline{\lambda}_j + \underline{f}_{it}^T \underline{\xi}_j + \delta_{jt})\}} \quad (4)$$

where the reference group of ‘*interaction3<sub>itk</sub>*’ is male natives working full-time.<sup>105</sup>

#### 4. Data and descriptive statistics

Our empirical strategy uses a matched employer-employee database for the Belgian labour market between 1999 and 2016, provided by Statistics Belgium (STATBEL). This database was obtained by merging two datasets: the Structure of Earnings Survey (SES) and administrative data from the Belgian National Register (BNR). The SES covers all firms operating in Belgium with economic activities defined by the NACE-BEL 2008 Rev. 2 nomenclature.<sup>106</sup> Based on a sophisticated stratified sampling design, the SES provides a nationally representative sample of workers in the Belgian labour market.

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<sup>105</sup> Our equations (2), (3) and (4) deliver the same results as regressions with interaction effects (i.e. variables for origin, gender, and the interaction between origin and gender). Our regressions’ advantage is that they directly (and parsimoniously) estimate coefficients associated with the overall effect of origin, the corresponding moderator and the interaction between these variables. In contrast, in regressions with interaction effects, each coefficient associated with workers’ origin, the corresponding moderator and the interaction variable must be summed to obtain the overall effect.

<sup>106</sup> The NACE-BEL 2008 Rev. 2 is the statistical classification of economic activities in the European Union (Belgian Version). More precisely, our data cover the following sectors: (B) mining and quarrying, (C) manufacturing, (D) electricity, gas, steam and air conditioning supply, (E) water supply, sewerage, waste management, and remediation, (F) construction, (G) wholesale and retail trade, repair of motor vehicles and

**Table 1. Descriptive statistics by origin and generation – means and percentages**

	Sample of tertiary-educated workers born in or from:		
	Belgium	Developing countries <sup>a</sup>	
		First generation	Second generation <sup>b</sup>
Share of the sample (%) <sup>c</sup>	78.9	3.7	3.0
Observations	311,222	14,459	11,748
<b>Region of birth (%)</b>			
Belgium	100.0		
<u>Developing countries<sup>d</sup></u>			
Sub-Saharan African countries		27.1	46.0
Maghreb countries		25.1	29.9
Near and Middle Eastern countries		11.0	9.7
Emerging and developing Asian countries		15.1	5.4
Other Eastern European countries		12.0	6.3
Latin American and Caribbean countries		9.8	2.7
<b>Worker characteristics</b>			
Women (%):	37.4	34.5	43.4
Age categories (%):			
20-24	6.2	2.7	10.3
25-29	18.0	15.5	31.8
30-39	36.8	40.6	42.9
40-49	26.7	27.1	12.1
50+	12.4	14.0	2.9
Tenure in years	7.8	5.2	4.3
Education (%):			
Bachelor	57.6	57.5	57.3
Master	39.7	38.1	39.9
Advanced Master or PhD	2.7	4.4	2.8
Household (%):			
Without children living at home	30.3	33.3	32.7
With children living at home	68.1	59.4	64.3
Other households <sup>e</sup>	1.6	7.3	3.1
<b>Employment characteristics</b>			
Type of contract (%):			
Permanent	95.9	90.6	91.9
Fixed-term	3.6	8.5	7.3
Internship or apprenticeship	0.5	1.0	0.8
Part-time work (%) <sup>f</sup>	4.7	7.7	4.4
Overtime work (%) <sup>g</sup>	1.9	2.7	2.0
Occupational categories - ISCO1 (%):			
Managers	12.5	9.0	8.9
Professionals	38.1	35.2	39.0
Technicians and associate professionals	17.9	14.0	19.1
Clerical support	23.1	19.4	23.4
Service and sales workers	4.0	6.2	5.0
Craft and related trades workers	2.0	4.2	1.9
Plant and machine operators and assemblers	1.8	4.6	1.8
Elementary Occupations	0.6	7.4	0.9

Table 1. (Continued)

motorcycles, (H) transportation and storage, (I) accommodation and food service activities, (J) information and communication, (K) financial and insurance activities, (L) real estate activities, (M) professional, scientific and technical activities, (N) administrative and support service activities, (P) Education, (Q) Human health and social work activities, (R) Arts, entertainment and recreation and (U) Other service activities. It should be noted that the SES provides information on public sectors (P-Q-R) every four years.

**Table 1. Continued**

	Sample of tertiary-educated workers born in or from:		
	Belgium	Developing countries <sup>a</sup>	
		First generation	Second generation <sup>b</sup>
<b>Firm characteristics</b>			
Sector of activity - NACE1 (%):			
B - Mining and Quarrying	0.1	0.1	0.1
C - Manufacturing	29.8	24.5	20.0
D - Electricity, gas, steam, and air conditioning supply	2.1	0.8	1.9
E - Water supply, sewerage, waste management and remediation activities	0.8	0.6	0.5
F - Construction	4.2	2.5	3.5
G - Wholesale and retail trade, repair of motor vehicles and motorcycles	18.5	15.7	16.7
H - Transportation and storage	5.2	6.2	5.0
I - Accommodation and food service activities	0.9	3.4	1.6
J - Information and communication	11.7	12.1	15.9
K - Financial and insurance activities	2.6	4.3	4.3
L - Real Estate activities	0.3	0.4	0.4
M - Professional, scientific, and technical activities	12.4	14.5	14.2
N - Administrative and support service activities	8.3	11.6	13.3
P - Education	0.3	0.3	0.3
Q - Human Health and social work activities	2.4	2.0	1.8
R - Arts, entertainment, and recreation	0.1	0.3	0.1
U - Other service activities	0.3	0.6	0.5
Size of the firm (FTE number of employees)	459.0	505.3	481.2
Firm-level collective agreement (Yes) (%)	28.2	27.0	26.0
More than 50% privately owned (%)	95.1	96.1	94.9
Region where the firm is located (%):			
Brussels	19.2	34.6	37.3
Flanders	64.8	45.3	38.8
Wallonia	16.1	20.1	24.0

Notes: Worker and firm weights are used in the calculation of means and percentages. <sup>a</sup> By 'developing countries', we mean either transition and developing countries listed in the United Nations' (2020) classification and/or emerging market and developing economies listed in the IMF's (2020) classification. <sup>b</sup> Second-generation immigrants' origin is defined according to the father's country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother's country of birth is retained. <sup>c</sup> The groups 'immigrants from developed countries' and 'others' are also considered in our empirical strategy. They represent 13.3% and 1.1% of our sample, respectively. Descriptive statistics for these groups are shown in Appendix 3. <sup>d</sup> Appendix 2 shows the list of developing countries by region of birth. For the sake of accuracy in correctly classifying immigrants by geographical origin and economic development level, we construct our geographical classification of countries based on both the United Nations' (2020) classification and the IMF's (2020) classification. <sup>e</sup> 'Other households' refer to brothers/sisters living together, friends living together, students or workers' homes, etc. <sup>f</sup> A worker is recognized as a part-time employee if he/she works less than 30 hours per week. <sup>g</sup> Overtime is when an employee works more than his/her contractual working hours. Source: STATBEL, 1999-2016.

The SES also contains granular information on the structural characteristics of the firms (e.g. sector of activity, number of employees and type of collective agreement) and the demographic and employment characteristics of workers (e.g. age, gender, educational attainment, tenure, occupation and type of contract). Regarding the administrative data from the BNR, they provide reliable information on workers' country of birth, that of their parents and the type of household they live. The original sample contains information on 1,604,835 workers employed in 20,375 firms.

After calculating educational mismatches by occupation-age-sector cell (see Section 3.1 for more details), two filters were applied to the original sample. First, we restricted our sample to

tertiary-educated workers to focus exclusively on the population for which overeducation is more likely to be an issue (1,147,473 observations deleted).<sup>107</sup> Second, to avoid misclassification issues in the design of groups by origin and generation, we dropped workers born in Belgium but with missing information on the country of birth of at least one of their parents (33,826 observations deleted).<sup>108</sup> Therefore, the final sample consists of 396,462 workers employed in 15,628 firms.

Moreover, STATBEL has also given us access to the 2021 Labour Force Survey for Belgium and its ad-hoc module on '*Migration and labour market*'. This dataset contains around 22,000 observations and is representative of the working-age population in Belgium. We use descriptive statistics from this dataset as a complementary information source to better understand our results.

Table 1 shows the statistical profiles of tertiary-educated workers by origin and generation.<sup>109</sup> 78.9% of workers in our sample are Belgian natives, while F-G immigrants born in developing countries and their descendants represent 3.7% and 3%, respectively. Moreover, the groups 'immigrants from developed countries' and 'others' constitute 13.3% and 1.1% of our sample, respectively (see Appendix 3). Within the cohort of immigrants from developing countries, we observe that around 3 in 4 workers are geographically originating from Sub-Saharan Africa and the Maghreb, which accords with the total distribution of the working-age population in Belgium by geographical origin between 2008 and 2016 (FPS Employment and Unia, 2019).

Regarding worker characteristics, S-G immigrants from developing countries are younger than the other groups of workers. For instance, the proportion of S-G immigrants from developing countries aged 20-39 amounts to 42.1%, while those of natives and their F-G peers are 24.2% and 18.2%, respectively. In line with their age, S-G immigrants also have, on average, less tenure than natives and their F-G peers (4.3% vs. 5.2% and 7.8%, respectively). The shares of

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<sup>107</sup> Using our database, we find that within the cohort of workers with at most upper secondary education, F-G immigrants born in developing countries and their S-G peers are just as likely to be overeducated as natives. Those estimates can be obtained on request.

<sup>108</sup> Around 8% of tertiary-educated workers born in Belgium were dropped because of missing information on their parental country of birth. Our estimates show that these workers face a 2% points higher likelihood of being overeducated than natives. Therefore, if we assume that a substantial part of these workers born in Belgium have at least a foreign-born parent, our findings on the overeducation gap between natives and S-G immigrants must be interpreted as a lower bound.

<sup>109</sup> To shorten the term that describes tertiary-educated workers, tertiary-educated natives and tertiary-educated immigrants in the remainder of this paper, we refer to them simply as workers, natives and immigrants, respectively.

workers by tertiary education level are similar between natives and immigrants from developing countries across two generations. It should also be noted that around two-thirds of workers belong to a couple with children living at home, irrespective of origin and generation.

Regarding employment and firm characteristics, F-G immigrants born in developing countries and their S-G peers are more clustered in fixed-term contracts than natives. The share of S-G immigrants from developing countries working part-time is close to that of natives (4.4% vs. 4.7%) and two times smaller than that of their F-G peers (7.7%). We also observe that the distribution of immigrants from developing countries by occupation converges towards that of natives across two generations, except for managerial positions. Focusing on the most representative sectors of activity in Belgium, the share of immigrants from developing countries in sector C (Manufacturing) decreases across two generations, while those in sector G (wholesale and retail trade, including repair of motor vehicles and motorcycles), sector J (information and communication) and sector N (administrative and support service activities) increase. In addition, the share of immigrants from developing countries in sector M (professional, scientific and technical activities) remains stable across two generations (between 14.2% and 14.5%) and relatively close to that of natives (12.4%).

Table 2 documents the incidence of overeducation by origin and generation. Column (1) shows that the share of overeducated workers is greater within the cohort of F-G immigrants born in developing countries than within that of natives (53.7% vs. 43.5%). By contrast, S-G immigrants from developing countries reverse this gap, as their incidence of overeducation is 42.1%. Moreover, breaking down the groups by gender, there is a gender overeducation gap among natives (7.7%) and among S-G immigrants from developing countries (4.1%) (see columns (2)-(3)). In contrast, the incidence of overeducation for F-G female immigrants born in developing countries is somewhat lower than that of their F-G male peers (51.0% vs. 52.7%). Focusing on the type of employment, the share of overeducated workers is much more prominent among natives in part-time jobs than natives in full-time jobs (59.9% vs. 42.7%) (see columns (4)-(5)). Moreover, when it comes to immigrants in part-time jobs, their incidence of overeducation is much larger than that of natives in part-time jobs, irrespective of generation. More precisely, 80.1% of F-G immigrants born in developing countries working part-time are overeducated, and 71.7% of their S-G counterparts are overeducated.

**Table 2. Incidence of overeducation (%) by origin and generation across moderating variables**

	Gender		Employment		Gender and employment				
	Total	Men	Women	Full-time work	Part-time work	Full-time work		Part-time work	
						Men	Women	Men	Women
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tertiary-educated workers born in/from:									
<b>Belgium</b>	43.5 <i>(135,295 obs.)</i>	40.5 <i>(77,760 obs.)</i>	48.2 <i>(57,535 obs.)</i>	42.7 <i>(126,884 obs.)</i>	59.9 <i>(8,411 obs.)</i>	40.3 <i>(76,067 obs.)</i>	46.9 <i>(50,817 obs.)</i>	55.4 <i>(1,693 obs.)</i>	61.1 <i>(6,718 obs.)</i>
<b>Developing countries<sup>a</sup></b>									
First generation	53.7 <i>(7,534 obs.)</i>	52.7 <i>(4,944 obs.)</i>	51.0 <i>(2,590 obs.)</i>	50.0 <i>(6,736 obs.)</i>	80.1 <i>(798 obs.)</i>	51.4 <i>(4,621 obs.)</i>	47.3 <i>(2,115 obs.)</i>	83.5 <i>(323 obs.)</i>	78.0 <i>(475 obs.)</i>
Second generation	42.1 <i>(5,052 obs.)</i>	40.7 <i>(2,718 obs.)</i>	44.8 <i>(2,334 obs.)</i>	41.7 <i>(4,693 obs.)</i>	71.7 <i>(359 obs.)</i>	40.7 <i>(2,600 obs.)</i>	43.1 <i>(2,093 obs.)</i>	79.7 <i>(118 obs.)</i>	68.3 <i>(241 obs.)</i>

*Notes:* Using a realized matches approach, overeducation is identified within each occupation-age-sector cell (see Section 3.1 for more details). <sup>a</sup> S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother's country of birth is retained. Source: STATBEL, 1999-2016.

Finally, we observe that the shares of overeducated workers in full-time jobs by gender (see columns (6)-(7)) are similar to those of the total sample by gender (see columns (2)-(3)). However, there are important gender differences in the incidence of overeducation among part-time workers. Specifically, the share of overeducated female natives in part-time jobs is larger than that of their male peers in part-time jobs (61.1% vs. 55.4%) (see columns (8)-(9)). In contrast, the share of overeducated F-G female immigrants born in developing countries working part-time is smaller than that of their male peers working part-time (78.0% vs. 83.5%). Similarly, the incidence of overeducation for S-G female immigrants from developing countries working part-time is smaller than that of their male peers working part-time (68.3% vs. 79.7%). However, it should be highlighted that in absolute terms, female workers are more representative in part-time jobs than male workers, irrespective of origin and generation (see the number of observations between parentheses in Table 2).

## 5. Results

### 5.1 Benchmark scenario

To investigate the intergenerational relationship between origin and overeducation, Table 3 shows the marginal effects of our benchmark GOLOGIT regression (see equation (1)). We find that the likelihood of being overeducated for a worker increases by 10.5% points if the worker was born in a developing country. In other words, F-G immigrants born in developing countries are much more likely to be overeducated than natives, whose overeducation incidence is 43.5% (see column 1 in Table 2).<sup>110</sup> We cannot ultimately assert whether this labour market disadvantage for F-G immigrants born in developing countries is utterly related to their origin or unobserved individual heterogeneity (e.g. motivation, language proficiency and organization skills). However, given the granular realized matches approach used in the identification of overeducation and the large number of covariates included in our GOLOGIT regression, we feel confident to attribute this finding at least partially to a penalty related to immigrants' origin.

Moreover, it should be noted that the estimates of standard econometric models go in the same direction as those of our GOLOGIT regressions, although their magnitude differs (Appendix 4). For instance, OLS estimates suggest that F-G immigrants born in developing countries face a 12.1% points higher likelihood of being overeducated than natives, whereas OLOGIT

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<sup>110</sup> Our results in Table 3 also show that immigrants from developed countries are 1.3% less likely to be overeducated than natives, and the group 'others' is just as likely to be overeducated as natives.

estimates quantify this penalty in 9.4%. However, these standard econometric models face significant constraints (e.g. linearity and parallel regression assumptions), which may lead to unbiased estimations. Therefore, our GOLOGIT regressions provide more precise estimates by dealing with these constraints.

Turning to S-G immigrants from developing countries, we find no significant relationship between their origin and their likelihood of being overeducated. Put differently, S-G immigrants from developing countries are just as likely to be overeducated as natives.<sup>111</sup> Therefore, our GOLOGIT estimates align, on average, with the classical assimilation theory, which suggests that S-G immigrants from developing countries are treated as natives in the recruitment or promotion process.

The following assumptions can explain the disappearance of immigrant overeducation across two generations: i) S-G immigrants are likely to have good proficiency in at least one of the languages used in the Belgian labour market (i.e. French, Dutch or English), as they completed their whole education in Belgium; ii) employers may consider S-G immigrants as natives since they have accumulated human capital specific to Belgium (e.g. tertiary diplomas from Belgian universities or internships in firms located in Belgium); and iii) S-G immigrants have probably built better social networks than their parents due to a process of socialization from childhood to adulthood, which can be helpful in their job search and progress along the job ladder.

As workers' origin does not exclusively explain their likelihood of being overeducated, we also find that the coefficients associated with our covariates are statistically significant and have the expected signs.<sup>112</sup> These complementary results further support our choice of moderating variables. Specifically, being a woman increases the likelihood of being overeducated for a worker by 5% points. Similarly, part-time workers are 15.6% points more likely to be overeducated than full-time workers.

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<sup>111</sup> In addition, standard econometric models (i.e. OLS and OLOGIT regressions) also suggest that S-G immigrants face the same likelihood of being overeducated as natives.

<sup>112</sup> More precisely, having children at home or having a non-permanent contract is positively linked to overeducation. Also, working overtime and in a firm located outside Belgium's capital (i.e. Brussels) increases the likelihood of being overeducated. By contrast, the size of the firm is negatively associated with overeducation. Similarly, tenure reduces the likelihood of being overeducated, albeit up to a certain level, because their relationship is quadratic. Regarding the type of tertiary education, a worker holding a master's degree is less likely to be overeducated than a worker holding a bachelor's degree. However, holding advanced master's or PhD's degrees substantially increases the likelihood of being overeducated.

**Table 3. Benchmark: average marginal effects - GOLOGIT regression**

	Probability of being overeducated
Tertiary-educated workers born in/from:	(1)
<b>Belgium</b> (n = 311,222)	Reference
<b>Developing countries<sup>a</sup></b>	
First generation (n = 14,459)	0.105*** (0.010)
Second generation (n = 11,748)	0.008 (0.007)
<b>Developed countries<sup>b</sup></b> (n = 54,524)	-0.013*** (0.005)
<b>Others<sup>c</sup></b> (n = 4,509)	0.008 (0.010)
<u>Control variables</u>	
Women	0.050*** (0.005)
Tenure	-0.002*** (0.001)
Squared tenure	0.000*** (0.000)
Level of education (ref. Bachelor)	
Master	-0.060*** (0.010)
Advanced Master or PhD	0.543*** (0.009)
Type of household (ref. without children living at home)	
With children living at home	0.009*** (0.003)
Other households	-0.014* (0.008)
Type of contract (ref. permanent)	
Fixed term	0.104*** (0.029)
Internship	0.067** (0.028)
Part-time work	0.156*** (0.011)
Overtime work	0.145*** (0.015)
Size of the firm (FTE number of employees in log)	-0.021*** (0.003)
Firm-level collective agreement (Yes)	0.018** (0.008)
More than 50% privately owned	0.008 (0.024)
Region (ref. Brussels)	
Flanders	0.076*** (0.010)
Wallonia	0.084*** (0.013)
Year fixed effects <sup>d</sup>	Yes
Occupation-age-sector cells <sup>e</sup>	13,628
Observations	396,462

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Worker and firm weights are used in the GOLOGIT regression. Robust standard errors are in parentheses, which are clustered at the firm level. <sup>a</sup> Second-generation immigrants' origin is defined according to the father's country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother's country of birth is retained. <sup>b</sup> The group 'immigrants from developed countries' includes F-G immigrants born in developed countries and their S-G peers. <sup>c</sup> The group 'others' refers to workers born in developing countries with both parents born in Belgium (e.g. children of expatriates). <sup>d</sup> 17 year dummies. <sup>e</sup> Using a realized matches approach, overeducation is identified within each occupation-age-sector cell (see Section 3.1 for more details). Source: STATBEL, 1999-2016.

**Table 4. Geographical origin: average marginal effects - GOLOGIT regression**

Tertiary-educated workers born in/from:		Probability of being overeducated
		(1)
<b>Belgium</b> (n = 311,222)		Reference
<b>Developing countries<sup>a</sup></b>		
Sub-Saharan African countries	First generation (n = 3,913)	0.121*** (0.015)
	Second generation (n = 5,403)	-0.020** (0.009)
Maghreb countries	First generation (n = 3,634)	0.180*** (0.016)
	Second generation (n = 3,517)	0.032** (0.015)
Near and Middle Eastern countries	First generation (n = 1,589)	0.093*** (0.023)
	Second generation (n = 1,138)	0.032 (0.021)
Emerging and developing Asian countries	First generation (n = 2,175)	0.020 (0.016)
	Second generation (n = 634)	-0.023 (0.029)
Non-EU Eastern European countries	First generation (n = 1,733)	0.092*** (0.019)
	Second generation (n = 742)	0.026 (0.024)
Latin American and Caribbean countries	First generation (n = 1,415)	0.018 (0.021)
	Second generation (n = 314)	0.019 (0.035)
<b>Control variables</b>		
Year fixed effect <sup>b</sup>		Yes
Worker characteristics <sup>c</sup>		Yes
Employment characteristics <sup>d</sup>		Yes
Firm characteristics <sup>e</sup>		Yes
Occupation-age-sector cells <sup>f</sup>		13,628
Observations		396,462

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Worker and firm weights are used in the GOLOGIT regression. Robust standard errors are in parentheses, which are clustered at the firm level. The groups ‘immigrants from developed countries’ and ‘others’ are also included in the regression, but their estimates are not portrayed in this table. <sup>a</sup> Second-generation immigrants’ origin is defined according to the father’s country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother’s country of birth is retained. <sup>b</sup> 17 year dummies. <sup>c</sup> Gender, level of tertiary education, tenure, squared tenure and type of household. <sup>d</sup> Type of contract and dummies for part-time and overtime work. <sup>e</sup> Size of the firm (FTE number of workers in log), dummy for more than 50% privately owned, dummy for a firm-level collective agreement and region where the firm is located (Brussels, Flanders or Wallonia). <sup>f</sup> Using a realized matches approach, overeducation is identified within each occupation-age-sector cell (see Section 3.1 for more details). Source: STATBEL, 1999-2016.

Using a more fine-grained geographical classification in equation (1), Table 4 reports the marginal effects of our GOLOGIT estimates regarding the intergenerational relationship between geographical origin and overeducation. We find that F-G immigrants born in the Maghreb are the geographical group that experiences the highest likelihood of being overeducated (18.0% points higher than natives). To a lesser extent, F-G immigrants born in

Sub-Saharan Africa are also more likely to be overeducated than natives by 12.1% points. Regarding F-G immigrants born in the Near and Middle East and non-EU Eastern Europe, their likelihood of being overeducated is around 9.0% points higher than that of natives. In contrast, F-G immigrants born in emerging and developing Asia, Latin America and the Caribbean are just as likely to be overeducated as natives.

Turning to S-G immigrants from developing countries, we find three intergenerational patterns. First, immigrant overeducation vanishes across two generations for workers from the Near and Middle East and non-EU Eastern Europe. In addition, in line with their F-G peers, S-G immigrants from emerging and developing Asia, Latin America and the Caribbean perform on a par with natives (i.e. no immigrant overeducation across two generations for these geographical groups). Second, although S-G immigrants from the Maghreb fare better than their F-G peers, their likelihood of being overeducated remains 3.2% points higher than that of natives. Third, S-G immigrants from Sub-Saharan Africa experience a 2.0% points lower probability of being overeducated than natives, thus reversing the initial penalty faced by their F-G peers. Statistically, the good performance of S-G immigrants from Sub-Saharan Africa may be explained by their important share of workers holding a master's degree (47.2%), which is even higher than that of natives (39.7%) (see Appendix 5). Indeed, the probability of being overeducated is lower for workers holding a master's degree than a bachelor's degree (see the estimates associated with education in Table 3).

## **5.2 Gender and immigrant overeducation**

In this Subsection, we investigate the moderating effect of gender on the intergenerational nexus between origin and overeducation using equation (2). Results are displayed in Table 5. Our gender-interacted estimates suggest that while F-G male immigrants born in developing countries experience a 14.5% points higher likelihood of being overeducated than male natives, S-G male immigrants from developing countries are just as likely to be overeducated as male natives. These estimates go in the same direction as those of our benchmark GOLOGIT regression in Table 3, where immigrant overeducation also disappears across two generations.

However, when it comes to female workers, the findings are more nuanced. More precisely, our gender-interacted estimates suggest that female natives experience a 5.6% points higher likelihood of being overeducated than male natives (i.e. evidence of a gender overeducation

gap). We also find that F-G female immigrants born in developing countries are 5.5% points more likely to be overeducated than female natives (i.e. F-G female immigrants born in developing countries experience an 11.1% points higher likelihood of being overeducated than male natives). In addition, the coefficient associated with F-G female immigrants born in developing countries is statistically different from that associated with female natives (see the test for equality of coefficients at the bottom of Table 5). Thus, there are solid grounds for suggesting that F-G female immigrants born in developing countries undergo a double penalty in their likelihood of being overeducated due to their gender and foreign background.

**Table 5. Gender and origin: average marginal effects - GOLOGIT regression**

		Probability of being overeducated
Tertiary-educated workers born in/from:		(1)
<b>Belgium</b>		
Men (n = 191,913)		Reference
Women (n = 119,309) [1]		0.056*** (0.005)
<b>Developing countries<sup>a</sup></b>		
Men	First generation (n = 9,382)	0.145*** (0.012)
	Second generation (n = 6,541)	0.015 (0.010)
Women	First generation (n = 5,077) [2]	0.111*** (0.012)
	Second generation (n = 5,207) [3]	0.038*** (0.013)
<b>Control variables</b>		
Year fixed effects <sup>b</sup>		Yes
Worker characteristics <sup>c</sup>		Yes
Employment characteristics <sup>d</sup>		Yes
Firm characteristics <sup>e</sup>		Yes
Test for equality of coefficients (p-value) <sup>f</sup>		
[1] = [2]		0.00
[1] = [3]		0.12
[2] = [3]		0.00
Occupation-sector-age cells <sup>g</sup>		13,628
Observations		396,462

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Worker and firm weights are used in the GOLOGIT regression. Robust standard errors are in parentheses, which are clustered at the firm level. The groups ‘immigrants from developed countries’ and ‘others’ are also included in the regression, but their gender-interacted estimates are not portrayed in this table (available on request). <sup>a</sup> Second-generation immigrants’ origin is defined according to the father’s country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother’s country of birth is retained. <sup>b</sup> 17 year dummies. <sup>c</sup> Level of tertiary education, tenure, squared tenure and type of household. <sup>d</sup> Type of contract and dummies for part-time and overtime work. <sup>e</sup> Size of the firm (FTE number of workers in log), dummy for more than 50% privately owned, dummy for firm-level collective agreement and region where the firm is located (Brussels, Flanders or Wallonia). <sup>f</sup> The null hypothesis of the test specifies that the estimates are not statistically different from each other if the p-value is higher than 0.10. <sup>g</sup> Using a realized matches approach, overeducation is identified within each occupation-age-sector cell (see Section 3.1 for more details). Source: STATBEL, 1999-2016.

Regarding S-G female immigrants from developing countries, our gender-interacted estimates suggest that they no longer face a penalty in their likelihood of being overeducated due to their origin. More precisely, S-G female immigrants from developing countries are 1.8% points less likely to be overeducated than female natives (i.e. S-G female immigrants from developing countries undergo a 3.8% points higher likelihood of being overeducated than male natives). However, although S-G female immigrants from developing countries seem to perform better than female natives, it is worth noting that their coefficient associated with their origin is not statistically different from that for female natives (see the test for equality of coefficients at the bottom of Table 5). Therefore, S-G female immigrants from developing countries are just as likely to be overeducated as female natives (i.e. only evidence of a gender penalty in their likelihood of being overeducated).

### **5.3 Part-time work and immigrant overeducation**

Column (5) in Table 2 shows that in our sample, about 60% of natives in part-time jobs are overeducated. In addition, this incidence is higher if the worker has a foreign background (80.1% for F-G immigrants born in developing countries and 71.7% for their S-G peers). Thus, we leverage equation (3) to study the moderating role of part-time work in the intergenerational nexus between origin and overeducation. Results are shown in Table 6. We find that within the cohort of full-time workers, F-G immigrants born in developing countries are 9.4% points more likely to be overeducated than natives. In contrast, S-G immigrants from developing countries working full-time perform similarly to natives working full-time in terms of overeducation. These findings largely mirror those of our benchmark GOLOGIT regression in Table 3.

Moreover, our estimates suggest that natives working part-time face a 14.1% points higher likelihood of being overeducated than natives working full-time. However, it should be noted that working part-time affects more immigrants than natives in terms of overeducation. More precisely, F-G immigrants born in developing countries working part-time are 25.7% points more likely to be overeducated than natives working part-time (i.e. F-G immigrants born in developing countries working part-time face a 39.8% higher likelihood of being overeducated than natives working full-time). Although this overeducation gap between natives and immigrants reduces across two generations, it remains sizeable. In other words, S-G immigrants from developing countries working part-time are 12.4% points more likely to be overeducated than natives working part-time (i.e. S-G immigrants from developing countries working part-

time experience a 26.5% higher likelihood of being overeducated than natives working full-time).

**Table 6. Part-time work and origin: average marginal effects - GOLOGIT regression**

		Probability of being overeducated
Tertiary-educated workers born in/from:		(1)
<b>Belgium</b>		
Full-time work (n = 297,169)		Reference
Part-time work (n = 14,053)		0.141*** (0.011)
<b>Developing countries<sup>a</sup></b>		
Full-time work	First generation (n = 13,463)	0.094*** (0.010)
	Second generation (n = 11,247)	-0.001 (0.008)
Part-time work	First generation (n = 996)	0.398*** (0.022)
	Second generation (n = 501)	0.265*** (0.033)
<b>Control variables</b>		
Year fixed effects <sup>b</sup>		Yes
Worker characteristics <sup>c</sup>		Yes
Employment characteristics <sup>d</sup>		Yes
Firm characteristics <sup>e</sup>		Yes
Occupation-sector-age cells <sup>f</sup>		13,628
Observations		396,462

*Notes:* \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Worker and firm weights are used in the GOLOGIT regression. Robust standard errors are in parentheses, which are clustered at the firm level. The groups ‘immigrants from developed countries’ and ‘others’ are also included in the regression, but their estimates associated with full- or part-time work are not portrayed in this table (available on request). <sup>a</sup> Second-generation immigrants’ origin is defined according to the father’s country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother’s country of birth is retained. <sup>b</sup> 17 year dummies. <sup>c</sup> Gender, level of tertiary education, tenure, squared tenure and type of household. <sup>d</sup> Type of contract and a dummy for overtime work. <sup>e</sup> Size of the firm (FTE number of workers in log), dummy for more than 50% privately owned, dummy for a firm-level collective agreement and region where the firm is located (Brussels, Flanders or Wallonia). <sup>f</sup> Using a realized matches approach, overeducation is identified within each occupation-age-sector cell (see Section 3.1 for more details). Source: STATBEL, 1999-2016.

However, caution must be exercised when interpreting these results. Indeed, the relationship between part-time work and overeducation might suffer from endogeneity (e.g. reverse causality). Although 2SLS regressions could tackle this econometric issue, it remains challenging to find valid instruments, namely variables that are both relevant (i.e. goods predictors of part-time work) and exogenous (i.e. uncorrelated with the error of being overeducated). In addition, our potential endogenous variable is represented by nine categories in the regression (i.e. the interactions between origin and part-time work), which implies the search of at least nine instruments to guarantee identification in 2SLS regressions (i.e. having as many instruments as endogenous variables to satisfy one of 2SLS regressions’ conditions).

Accordingly, although our estimates provide solid evidence of a relationship between part-time work and immigrant overeducation, they should not be interpreted as causal.

#### **5.4 Three-way interaction: origin, gender and part-time work**

The literature suggests that part-time work is mainly an issue for women because they are more likely to work part-time due to motherhood and home production (e.g. Kifle et al., 2014; Piton, 2022). Our LOGIT estimates accord with this statement, as they suggest that the likelihood of working part-time for female workers significantly increases when they have children at home: by 7.1% points for female natives, by 7.2% points for F-G female immigrants born in developing countries and by 3.9% points for S-G female immigrants from developing countries (see Appendix 6). In contrast, we find no significant effect of parenthood on the likelihood of working part-time for male workers, irrespective of origin and generation. These results remain largely stable after controlling for a large set of covariates. Accordingly, we use equation (4) to implement a three-way interaction (origin, part-time work and gender) in our GOLOGIT regression. Results are presented in Table 7.

Within the cohort of full-time female and male workers, our findings largely align with the gender-interacted estimates in Table 5. However, focusing on part-time workers, our three-way interaction reveals interesting new outcomes. First, we find that female natives working part-time are 3.3% points more likely to be overeducated than their male peers working part-time, who already face a 15.7% points higher likelihood of being overeducated than male natives working full-time.

Second, being born in a developing country skyrockets the likelihood of being overeducated for a part-time worker, regardless of gender. More precisely, F-G male immigrants born in developing countries working part-time are 29.2% points more likely to be overeducated than male natives working part-time (i.e. F-G male immigrants born in developing countries working part-time face a 44.9% higher likelihood of being overeducated than male natives working full-time). Similarly, F-G female immigrants born in developing countries working part-time are 22.3% points more likely to be overeducated than female natives working part-time (i.e. F-G female immigrants born in developing countries working part-time experience a 35.9% higher likelihood of being overeducated than female natives working full-time). In this regard, it should be noted that there is no significant difference between the likelihood of being

overeducated for F-G male immigrants born in developing countries and that of their F-G female peers (see the test for equality of coefficients at the bottom of Table 7).

Third, immigrant overeducation is a persistent intergenerational phenomenon within the cohort of part-time female and male workers. More precisely, S-G male immigrants from developing countries working part-time are 21.6% points more likely to be overeducated than male natives working part-time (i.e. S-G male immigrants from developing countries working part-time undergo a 37.3% higher likelihood of being overeducated than male natives working full-time). Similarly, S-G female immigrants from developing countries working part-time are 8% points more likely to be overeducated than female natives working part-time (i.e. S-G female immigrants from developing countries working part-time face a 27% higher likelihood of being overeducated than female natives working full-time). In addition, the test for equality of coefficients at the bottom of Table 7 shows that S-G male immigrants from developing countries working part-time fare worse than their S-G female peers working part-time in terms of overeducation.

The findings associated with our three-way interaction are in line with the literature, which suggests that family duties (e.g. informal childcare and home production) and ethnic norms (e.g. fertility rate and family hierarchy) affect the labour market expectations of female immigrants more than those of female natives (Blau et al., 2013; Fernández and Fogli, 2009; Jacobs et al. 2022c). However, it seems less clear that male immigrants revisit the labour market trajectories due to parenthood or ethnic identities (Nadim and Midtbøen, 2023). Therefore, other underlying mechanisms linking part-time work, origin and overeducation among male workers need to be considered. For instance, an excess supply of labour from male immigrants, which could foster employers' incentive to offer them jobs below their level of education or generate additional barriers preventing them from finding full-time jobs (i.e. jobs where the likelihood of being overeducated is less substantial).

Incidentally, it should be noted that descriptive statistics of the 2021 ad-hoc module of the Labour Force Survey (LFS) concerning migration in Belgium seem to be supportive of this interpretation. Figure 1 shows indeed that in 2021, the labour market participation rate of F-G male immigrants born in developing countries was more than 20% points higher than that of their F-G female peers. Moreover, this gender gap appears to be intergenerational persistent

among immigrants (i.e. the gender gap in participation rates of S-G immigrants from developing countries is still as high as 14% points).

Next, Figure 2 reveals that in 2021, the involuntary part-time employment rate of F-G male immigrants born in developing countries was substantially higher than that of natives (57.4% vs. 15.4%). This employment issue extends to S-G male immigrants from developing countries, whose involuntary part-time employment rate was 45.6%. However, when it comes to female immigrants, involuntary part-time work seems less problematic. Indeed, 20% of F-G female immigrants born in developing countries and 21.7% of their S-G female peers declared themselves in an involuntary part-time job. Thus, the additional difficulties immigrants face to find full-time jobs are likely to explain their extremely high likelihood of being overeducated when working part-time.

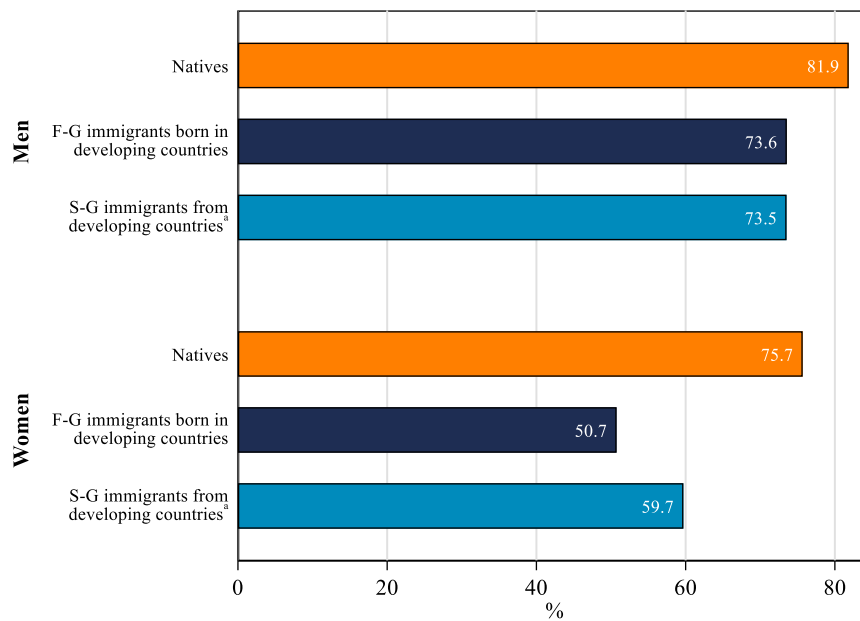
Finally, we cannot exclude an employment selection according to female and male workers' origin (i.e. taste-based, statistical or monopsonistic discrimination) as a potential channel to explain the intergenerational connection between part-time work and immigrant overeducation. For instance, it might be possible that when hiring tertiary-educated workers, some employers have preferences for natives or negative stereotypes against immigrants. Similarly, some employers might be susceptible to taking advantage of the employment barriers that tertiary-educated immigrants face to offer them part-time contracts in low-skilled occupations.

**Table 7. Gender, part-time work and origin: average marginal effects - GOLOGIT regression**

Tertiary-educated workers born in/from:		Probability of being overeducated	
		(1)	
<b>Belgium</b>			
Men	Full-time jobs (n = 188,859)	Reference	
	Part-time jobs (n = 3,054)	0.157*** (0.011)	
Women	Full-time jobs (n = 108,310)	0.054*** (0.002)	
	Part-time jobs (n = 10,999)	0.190*** (0.006)	
<b>Developing countries<sup>a</sup></b>			
Men	Full-time jobs	First generation (n = 8,995)	0.128*** (0.007)
		Second generation (n = 6,393)	0.018** (0.007)
	Part-time jobs	First generation (n = 387) [1]	0.449*** (0.024)
		Second generation (n = 148) [2]	0.373*** (0.048)
Women	Full-time jobs	First generation (n = 4,468)	0.080*** (0.010)
		Second generation (n = 4,854)	0.028*** (0.010)
	Part-time jobs	First generation (n = 609) [3]	0.413*** (0.018)
		Second generation (n = 353) [4]	0.270*** (0.035)
<b>Control variables</b>			
Year fixed effects <sup>b</sup>		Yes	
Worker characteristics <sup>c</sup>		Yes	
Employment characteristics <sup>d</sup>		Yes	
Firm characteristic <sup>e</sup>		Yes	
Test for equality of coefficients (p-value) <sup>f</sup>			
[1] = [3]		0.23	
[2] = [4]		0.08	
Occupation-sector-age cells <sup>g</sup>		13,628	
Observations		396,462	

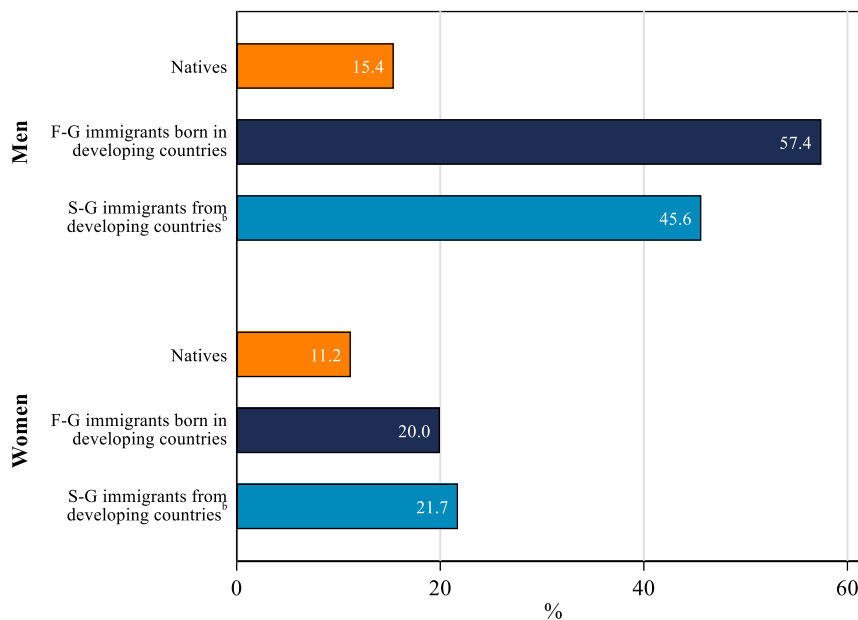
Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Worker and firm weights are used in the GOLOGIT regression. Robust standard errors are in parentheses, which are clustered at the firm level. The groups ‘immigrants from developed countries’ and ‘others’ are also included in the regression, but their gender-interacted estimates associated with full- or part-time work are not portrayed in this table (available on request). <sup>a</sup> Second-generation immigrants’ origin is defined according to the father’s country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother’s country of birth is retained. <sup>b</sup> 17 year dummies. <sup>c</sup> level of tertiary education, tenure, squared tenure and type of household. <sup>d</sup> type of contract and a dummy for overtime work. <sup>e</sup> Size of the firm (FTE number of workers in log), dummy for more than 50% privately owned, dummy for a firm-level collective agreement and region where the firm is located (Brussels, Flanders or Wallonia). <sup>f</sup> The null hypothesis of the test specifies that the estimates are not statistically different from each other if the p-value is higher than 0.10. <sup>g</sup> Using a realized matches approach, overeducation is identified within each occupation-age-sector cell (see Section 3.1 for more details). Source: STATBEL, 1999-2016.

**Figure 1. Labour market participation rate in 2021 among people aged 20-64 in Belgium.**



*Notes:* The labour market participation rate is calculated as the share of employed and unemployed persons aged 20-64 in the total population (active and inactive persons) of that same age. <sup>a</sup> Second-generation immigrants' origin is defined according to the father's country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother's country of birth is retained. Source: 2021 Labour Force Survey, STATBEL.

**Figure 2. Involuntary part-time employment rate in 2021 among part-time workers aged 20-64 in Belgium.**



*Notes:* The involuntary part-time employment rate is defined as the percentage of part-time workers (i.e. workers who work less than 30h per week) who want to work more hours and are available in the next two weeks at the time of the survey. <sup>a</sup> Second-generation immigrants' origin is defined according to the father's country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother's country of birth is retained. Source: 2021 Labour Force Survey, STATBEL.

## 6. Conclusion

In the OECD area, the population with tertiary education increased from 26.1% in 2000 to 47.1% in 2020 (OECD, 2022). However, although educational expansion accords with the growing demand for tertiary-educated people in developed countries, it could also lead to many overeducation cases (e.g. an economist employed as a cashier in a supermarket) (Green and Henseke, 2016). Indeed, overeducation has become a persistent social and economic phenomenon in the developed world (McGuinness et al., 2018; Nugent, 2022). Moreover, the literature shows that overeducation rates are higher in developed countries with more immigrant labour because F-G immigrants are more likely to be overeducated than natives (e.g. Davia et al., 2017; Jacobs et al., 2020; Wen and Maani, 2018). However, the evolution of immigrant overeducation across generations remains largely unexplored. Put differently, very little is known about the overeducation of S-G immigrants (e.g. Falcke et al., 2020; Fernández-Reino et al., 2018). Therefore, we leverage rich employer-employee data, covering almost two decades (1999-2016), a granular realized matches approach and GOLOGIT regressions to investigate the intergenerational interplay between origin and overeducation among tertiary-educated workers in Belgium.

After accounting for differences in worker, employment and firm characteristics (e.g. gender, tenure, level of tertiary education, type of contract, overtime, firm size and firm-level collective agreements), our GOLOGIT estimates suggest that F-G immigrants born in developing countries are substantially more likely to be overeducated than natives, who face an important likelihood of being overeducated (43.5%). However, when it comes to S-G immigrants from developing countries, their likelihood of being overeducated is not statistically different from that of natives. In other words, immigrant overeducation disappears across two generations, thus illustrating the positive effect of being born, studying and socialising from childhood to adulthood in the host country (i.e. the classical assimilation theory). Our findings also hold for all geographical groups of immigrants, with the exception of workers from the Maghreb. More precisely, although S-G immigrants from the Maghreb perform much better than their F-G peers, their likelihood of being overeducated remains somewhat higher than that of natives.

Moreover, our gender-interacted estimates suggest that F-G female immigrants born in developing countries experience a double penalty in their likelihood of being overeducated due to their gender and migration background. In contrast, S-G female immigrants from developing

countries perform similarly to female natives, who experience a higher likelihood of being overeducated than male natives (i.e. a gender overeducation gap). Put differently, our gender-interacted estimates show that S-G female immigrants from developing countries only face a gender penalty in their likelihood of being overeducated.

However, it should be noted that all these findings only apply to the cohort of full-time female and male workers. Indeed, our GOLOGIT estimates show that part-time work makes immigrant overeducation intergenerationally persistent, in line with the segmented assimilation theory. More precisely, although S-G female and male immigrants from developing countries working part-time are less likely to be overeducated than their F-G same-gender peers, their likelihood of being overeducated is much higher than that of same-gender natives working part-time. The following underlying channels are likely to explain the nexus between part-time work and immigrant overeducation: i) the intergenerational transmission of ethnic and gender norms among female immigrants (e.g. fertility choices, informal childcare and family hierarchy); ii) the high incidence of involuntary part-time work among male immigrants from developing countries; and iii) an employment selection based on workers' origin (i.e. taste-based, statistical or monopsonistic discrimination).

Overall, our paper provides robust evidence on the disappearance of immigrant overeducation across two generations in Belgium. However, the main finding of our paper highly depends on the type of employment (i.e. working full-time or part-time), which emphasizes the importance of accounting for employment conditions when designing integration policies aimed at promoting the labour market integration of immigrants. Last but not least, our paper also opens promising avenues for further research on other barriers that F-G immigrants and their S-G peers may face at the workplace (e.g. mismatches between the job and the field of education, overeducation persistence and glass ceiling).

**PART 3**  
**GENERAL CONCLUSION**

The wealth accumulation by the richest, the middle class's impoverishment and the poor's marginalisation put pressure on the pillars of European societies (Keeley, 2015; OECD, 2019b). However, it should be noted that the welfare state significantly moderates the levels of inequality and poverty in Europe. Indeed, although EU market incomes are unequally distributed (e.g. a Gini coefficient *before* taxes and transfers of 52.2 in 2021), net social transfers reduce income inequality in the EU by almost half (e.g. a Gini coefficient *after* taxes and transfers of 30.1 in 2021) (Eurostat, 2023a).<sup>113</sup> In a similar vein, in 2019, the working-age poverty rate in the EU moved from 19.2% in a pre-tax benefit scenario to 9.3% in a post-tax benefit scenario (OECD, 2023a).<sup>114</sup> However, although the welfare state plays a crucial role in ensuring social protection and economic security for vulnerable people, it also masks structural issues a country may face. More precisely, the European labour market seems to struggle in the provision of decent jobs and wages to a sizeable share of the working-age population, thus deterring it from escaping poverty on the basis of a market income (Peña-Casa and Ghailani, 2021).

Moreover, researchers point out that immigrant-native inequalities in the European labour market remain sizeable and persistent across generations (e.g. Cupák et al., 2023; Dossche et al., 2022). More precisely, non-EU foreign-born people (i.e. mainly F-G immigrants born in developing countries) have more difficulties than EU natives in accessing the labour market (e.g. Lancee, 2021; OECD/EU, 2018; Piton and Rycx, 2021). Similarly, once in employment, F-G immigrants born in developing countries receive lower wages than EU natives and face wage discrimination (e.g. Fays et al., 2021; Ingwersen and Thomsen, 2021). Regarding employment conditions, F-G immigrants born in developing countries are also in a detrimental position as they experience a higher probability of being overeducated than EU natives (e.g. Jacobs et al., 2021; McGuinness and Byrne, 2015; Nielsen, 2011).

Moving from one generation to the next, one should expect that S-G immigrants from developing countries perform on par with natives in terms of employment conditions as they are born, educated and socialised from childhood to adulthood in an EU country (i.e. the

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<sup>113</sup> The Gini index *before (after)* taxes and transfers measures the extent to which the distribution of market (disposable) income among individuals or households deviates from a perfectly equal distribution. A Gini index ranges between 0 in the case of perfect equality and 100 in the case of perfect inequality.

<sup>114</sup> By working-age poverty rate *before (after)* taxes and transfers, we mean the ratio of people among the working-age population that falls below the poverty line, which is set at 50% of the median equivalised market (disposable) income of the working-age population. The following EU countries are not included in the calculation of poverty rates at the EU level due to missing values: Bulgaria, Croatia, Cyprus, Malta and Romania.

classical assimilation theory) (Alba et al., 2011; Park and Myers, 2010). However, most evidence shows that although S-G immigrants from developing countries have better labour market outcomes than their F-G counterparts, they do not attain the labour market performance of natives (i.e. the segmented assimilation theory) (e.g. Algan et al., 2010; Falcke et al., 2020; Gueye and Ceci-Renaud, 2022).

Moreover, it is worth noting that as far as we know, the wages of S-G immigrants from developing countries have only been investigated in six developed countries, and their employment conditions, especially the origin-related penalty in their likelihood of being overeducated (i.e. immigrant overeducation), have been largely overlooked by researchers. Therefore, this doctoral thesis contributes to the literature with three empirical chapters, one taking a cross-country approach and two focusing on the Belgian labour market, to better understand how institutions tailor poverty and how origin affects immigrants' wages and overeducation from an intergenerational perspective.

Using macro-level data for 24 developed countries between 1990 and 2015 and three econometric models (i.e. pooled OLS regressions with year fixed effects, two-way fixed effects regressions and two-way fixed effects two-stage least squares regressions), **Chapter 1** explores **the cross-country relationship between CB and working-age poverty** in pre- and post-tax benefit scenarios. The main contributions of Chapter 1 can be summarised along three axes: i) the development of an institutional framework to establish the association of CB with poverty, ii) the use of more recent data compared to previous studies, iii) the first cross-country study related to this topic in controlling for country-level, time-invariant unobserved heterogeneity (i.e. country fixed effects) and endogeneity issues. The results of Chapter 1 suggest that while bargaining coverage (i.e. bargaining centralisation) and trade union density are negatively associated with the incidence of low pay, there is no significant relationship between these two CB components and working-age poverty *before* taxes and transfers. Put differently, although stronger CB systems are related to lower earnings inequalities through wage compression at the lower end of the wage distribution, this mechanism seems not to attain people experiencing poverty. In contrast, higher levels of bargaining coverage and trade union density record lower working-age poverty *after* taxes and transfers, thus highlighting an underlying channel that can only be identified in a post-tax benefit scenario.

In this regard, Ahlquist (2017), Brady et al. (2016) and Pontusson (2013) state that trade unions are involved not only in the bargaining process of wage and employment conditions but also in social and political affairs. More precisely, in centralised CB systems, trade unions represent a large part of the workforce, which allows them to mobilise workers to vote for political parties with a benevolent social agenda (i.e. the power resource theory). Similarly, centralised CB systems go hand in hand with an elaborate institutional and policy framework, which allows trade unions to participate in consultation bodies or governing social institutions (e.g. social security systems), thus influencing the level of social spending (i.e. the social-democratic corporatist model). The results of Chapter 1 go in these directions, as they find a positive association of bargaining coverage and trade union density with public social spending. All these results remain significant after accounting for country fixed effects and controlling for endogeneity and sample selection issues in the regression analysis.

Chapter 1 provides robust evidence on the poverty-reducing effect of CB through the positive interaction between trade unions and the welfare state rather than through a direct effect on wage formation. Therefore, policymakers should consider this more extensive view of CB systems when designing labour institution reforms. Put differently, as developed countries with decentralised CB systems exhibit high levels of working-age poverty, policymakers should reconsider the relevance of CB systems to feature social dialogue among economic actors (e.g. employers' organisations, trade unions and/or government representatives). Indeed, reaching a consensus in the design of policies to favour the inclusion of vulnerable groups in the labour market can facilitate their implementation and broaden their scope of application.

The detractors of strong CB systems might state that this labour institution hurts overall employment and productivity outcomes. For instance, the insider-outsider theory states that trade unions only consider workers' interests (e.g. wage increases or better employment conditions), which imposes additional constraints on achieving full employment equilibrium (Bertola, 1999; Lindbeck and Snower, 2001). However, recent studies do not provide much support for this premise and have led to a reconsideration of the OECD stance on the relationship between CB and employment (e.g. Garnero, 2021; OECD, 2017a; OECD, 2018; OECD, 2019a). Similarly, developed countries with centralised CB systems (e.g. Belgium, Iceland and Sweden) recorded similar levels of labour productivity in 2019 as countries with

decentralised CB systems (e.g. Japan, the United Kingdom and the United States) (OECD, 2023b).<sup>115</sup>

**Chapter 2** uses a matched employer-employee database of 1.3 million workers, covering the period 1999-2016, and two econometric models (i.e. weighted log-linear regressions and reweighted, recentered influence function Oaxaca-Blinder decompositions) to analyse **the intergenerational relationship between origin and wages in Belgium**. Chapter 2 contributes to the literature with the first intergenerational study on immigrants ‘wages in Belgium, which further devotes particular attention to the moderating role of geographical origin, gender and position in the wage distribution. Our weighted log-linear regressions show that the overall wage gap between workers born in developed countries and workers from developing countries remains substantial across two generations (i.e. persistent intergenerational wage inequalities) and expands along the wage distribution. Using a more geographical classification in our estimations, we find that the overall wage gaps are more pronounced for immigrants from the Maghreb, non-EU Eastern Europe and the Near and Middle East. In addition, our gender-interacted estimates show that F-G female immigrants born in developing countries and their S-G same-gender counterparts receive lower wages than their male counterparts, who earn less than male workers born in developed countries (i.e. a double wage gap for female immigrants from developing countries).

However, controlling for a large set of control variables (e.g. age, education, occupation, type of contract, size of the firm and firm fixed effects), the adjusted wage gap for immigrants from developing countries disappears across two generations, irrespective of geographical origin and gender. Reweighted, recentered influence function Oaxaca-Blinder (RIF-OB) decompositions agree with these findings. In sum, the RIF-OB decompositions show that the overall wage gaps for F-G immigrants born in developing countries are driven by unfavourable human capital (i.e. low educational attainment or short tenure), low-paying occupational/sectoral characteristics and a wage structure effect (e.g. an adjusted wage gap). In contrast, the overall wage gaps for S-G immigrants from developing countries are essentially explained because they are younger and have less tenure than workers born in developed countries. Low-paying occupational/sectoral characteristics also play a role in their overall wage gaps, albeit to a much lesser extent than the role played in the overall wage gaps for their F-G peers.

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<sup>115</sup> Only two developed countries with fully or largely decentralised CB systems (i.e. Korea and Ireland) appear to fare better than countries with centralised CB systems in terms of labour productivity.

The key role of compositional effects in explaining overall wage gaps opens the debate on how to interpret them normatively. While differences in age and tenure can be attributed to the demographic characteristics of the immigrant population (e.g. S-G immigrants from developing countries are younger and have spent less time than natives in the labour market), differences in education, occupations and sectors require a more complex analysis. Indeed, the latter differences tend to reflect the existence of pre-labour market inequalities (e.g. an educational attainment gap between immigrants and natives) and occupational/sectoral segregation for immigrants from developing countries. Although the standard approach of the immigrant-native wage gap literature is to consider these compositional effects as differences in worker characteristics or individual preferences (e.g. working in a low-paying occupation that permits reconciling family and work) that intervene before entry into the labour market, the reality is that they may also be indirectly related to wage discrimination (e.g. immigrant workers face additional barriers to get promoted or move into high-paying occupations due to their origin and/or foreign diploma). However, from a statistical viewpoint, it turns out challenging to incorporate some part of these compositional effects in the estimation of wage discrimination, as this requires granular data on individual choices (e.g. do you work voluntarily in your current job?) and additional information on immigrants (e.g. has your foreign diploma been validated in the host country? or what is your proficiency level in the host country's language?).

In a cross-country comparison, the findings of Chapter 2 diverge, on average, from those of previous studies in other developed countries<sup>116</sup> (France, Germany, Sweden, the UK and the USA). However, it should be noted that such a comparison can only be made in the context of adjusted wage gaps because most empirical literature on the wages of S-G immigrants overlooks overall wage gaps. This said, in other developed countries, some studies show that the adjusted wage gap for immigrants from developing countries reduces across two generations but does not disappear, whereas others suggest that such a gap remains constant or expands from one generation to the next (e.g. Algan et al., 2010; Duncan and Trejo, 2018; Hammarstedt and Palme, 2012). The differences between the findings in Belgium and those elsewhere, conditioning on compositional effects, may be the result of centralised CB and strong trade unions in Belgium, which establish the adequate framework to tackle precarious employment conditions and offer fair wages (Garnero, 2021; Pineda-Hernández et al., 2022b). However, this statement hardly holds when the comparison involves France and Sweden (i.e. countries where

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<sup>116</sup> When the moderating role of gender and geographical origin is considered, evidence across countries is largely heterogeneous (see Section 2 in Chapter 2 for a detailed discussion about the findings of previous studies).

bargaining occurs at the sector level and/or trade unions represent a significant share of the labour force). Therefore, we cannot exclude the role of other country-specific characteristics (e.g. attitudes towards immigrants, labour market rigidities or the size and diversity of the immigrant population).

**Chapter 3** leverages an employer-employee dataset of around 400.000 tertiary-educated workers, covering almost two decades (1999-2016), a realized matches approach at the occupation-sector-age level and generalized ordered logit regressions to study **the intergenerational nexus between origin and overeducation in Belgium**. In addition to being one of the very first studies on the overeducation of S-G immigrants at the international level, Chapter 3 also provides a solid regression analysis of the moderating role of gender and part-time work in immigrant overeducation across two generations. The results of Chapter 3 show that all else equal, F-G immigrants born in developing countries experience a significantly higher likelihood of being overeducated than natives, whose incidence of overeducation is sizeable (i.e. around 4 in 10 natives are overeducated). In contrast, S-G immigrants from developing countries are just as likely to be overeducated as natives, with the exception of immigrants from the Maghreb.

Moreover, F-G female immigrants born in developing countries experience a double penalty in their likelihood of being overeducated due to their origin and migration background. However, S-G female immigrants from developing countries only experience a gender penalty in their likelihood of being overeducated. Put differently, S-G female immigrants from developing countries perform on par with female natives, who are more likely to be overeducated than male natives (i.e. a gender overeducation gap). However, it should be noted that all these findings partly apply to immigrants in part-time jobs. Indeed, although S-G female and male immigrants from developing countries working part-time are less likely to be overeducated than their F-G same-gender peers working part-time, their likelihood of being overeducated remains significantly higher than that of same-gender natives working part-time.

In a cross-country comparison, the results of Chapter 3 primarily align with those found in other European countries (Norway, Spain, Sweden and the Netherlands). Indeed, previous studies show that the likelihood of being overeducated for S-G immigrants is similar or close to that of natives and lower than that of their F-G peers (e.g. Larsen et al., 2018; Fernández-Reino et al., 2018). Therefore, a limited but growing body of empirical literature reinforces the idea that

accumulating host country education and being fluent in the host country's language (i.e. characteristics inherent to S-G immigrants but not always to their F-G peers) contribute to reducing labour market inequalities between immigrants and natives. However, it should be noted that a cross-country comparison of intergenerational studies on immigrant overeducation is only possible when full samples are considered (i.e. essentially full-time workers). Indeed, no previous study has investigated the moderating role of part-time work in immigrant overeducation. Yet, the results of Chapter 3 suggest that F-G immigrants and their S-G peers working part-time experience a significant origin-related penalty in their likelihood of being overeducated.

From a policymaker's perspective, the significant differences between overall and adjusted wage gaps for F-G immigrants born in developing countries, driven to a large extent by occupational/sectoral segregation, reveal an integration issue in the Belgian labour market. Put differently, it is plausible to assume that the small, adjusted wage gaps (e.g. wage discrimination) for F-G immigrants born in developing countries are guaranteed as long as employment segregation remains sizeable in the Belgian labour market. Similarly, the exceptionally high likelihood of being overeducated for F-G immigrants born in developing countries with a tertiary diploma and their S-G counterparts working part-time suggests that some employers underrate immigrants' qualifications or are more reluctant to hire or promote tertiary-educated people of foreign origin for high-skilled jobs (e.g. discrimination). However, we cannot exclude that immigrant overeducation can also be partly due to immigrants' limited knowledge of the Belgian primary labour market or imperfect transferability of foreign human capital (e.g. some educational qualifications acquired in developing countries are not recognized by the Belgian higher education system). Therefore, there are solid grounds for suggesting that immigrant integration policies in Belgium have mainly focused on guaranteeing access to employment for immigrants, leaving behind their wages and employment conditions once they secure a job. Against this background, **a set of policy recommendations** aimed at enhancing immigrant workers' labour market performance are presented below.

First, the main task of public employment offices is to provide employment solutions to job seekers and employers. However, they could extend their activities to monitor the first years of immigrant workers' careers in the Belgian labour market. By doing so, they would be able to propose specific professional training, vocational studies or evening courses to low-paying immigrant workers, which would foster their market valuation and their likelihood of being

promoted to a high-paying occupation or moving into a high-skilled sector. Second, the implementation of anonymous resumes in the recruitment process of non-bottleneck high-skilled occupations can help people with tertiary diplomas and names deemed discriminatory increase their chances of being called for an interview and being hired (Baert et al., 2015; Hangartner et al., 2021). Third, the recognition process of foreign academic diplomas should be reviewed to adapt it to the socioeconomic conditions of immigrants and the situation of the Belgian labour market. For instance, the introduction of free or low administrative costs for immigrants from low-income countries, a fast-track procedure for immigrants with foreign diplomas matching shortage occupations in Belgium and flexible rules (e.g. making a final decision based on a labour market approach rather than a strict educational one) can have a reducing-effect on immigrant overeducation and increase the likelihood of escaping elementary occupations and low-skilled sectors.

When it comes to female immigrants, additional policies should also be considered, as our findings show that F-G female immigrants born in developing countries and their S-G same-gender counterparts face double overall wage gaps and are overrepresented in the cohort of overeducated workers working part-time. For instance, the reinforcement of formal childcare policies (e.g. free-of-charge services or guaranteed places for disadvantaged households and more nursery schools in immigrant-dense neighbourhoods) can help immigrant mothers better deal with household production and labour market trajectories (Ünver et al., 2021). The implementation of communication channels between public institutions and immigrant families is also essential, as many are unaware of these services or do not know how to apply for them. The introduction of languages and vocational courses with flexible schedules for immigrant women with family duties can also enhance their labour market outcomes.

Similarly, policymakers should design specific integration policies for immigrant populations that are relatively more vulnerable in the labour market according to the findings of this doctoral thesis (e.g. immigrants from the Maghreb are the geographical group that experiences the most significant origin-related penalty in their likelihood of being overeducated). For instance, in exchange for reduced social security contributions, governments can encourage employers to participate in seminars or workshops on ethical issues, which might reduce stereotypes or discrimination against immigrants with a non-Western background. Also, the construction of housing across low immigrant-dense neighbourhoods can be an efficient planning tool to tackle ethnic marginalization and class prejudice (Alves, 2022). It is worth noting that although most

of the abovementioned policies are targeted towards F-G immigrants, their implementation could also have positive spillovers in the labour market integration of S-G immigrants. Indeed, the Belgian labour market would become more inclusive *vis-à-vis* people of foreign origin.

Last but not least, individuals, firms and governments in Europe should consider the integration of immigrants as a multi-dimensional investment for their economies and societies. More precisely, F-G immigrants and their S-G counterparts must not be treated only as an additional source of labour or strain on public social expenditure. They are also students who increase and diversify the stock of human capital, entrepreneurs who create new businesses and job opportunities, traders who bring new products to the local consumer market, volunteers who are involved in care and support activities, savers who invest a part of their income in the local economy, consumers who increase the demand for local goods and services, taxpayers who contribute to the maintenance of public services and the viability of the pension system, and young people who are essential to deal with population ageing in Europe.

This doctoral thesis also opens new avenues for future research. First, the use of two-way fixed effects regressions with heterogenous treatments may deliver more efficient estimates regarding changes in CB systems that occur at different periods in a panel of countries (e.g. the economic and social effects of CB reforms in New Zealand in 1987, Germany in 2002 and Greece in 2011<sup>117</sup>) (Callaway and Sant'Anna, 2021; De Chaisemartin and d'Haultfoeuille, 2020). Second, the interplay between labour market institutions and immigrant-native gaps from a cross-country perspective deserves more attention to establish a practical framework of integration policies at the European level. Third, the design of adequate immigrant integration policies can be fostered through the investigation of other moderating variables that may shape immigrant-native gaps across generations (e.g. foreign-sounding names and language spoken in immigrant parents' home country) and other employment issues that people of foreign origin are likely to experience (e.g. underrepresentation in managerial positions, overeducation due to the field of study and overrepresentation in in-work poverty rates).

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<sup>117</sup> The government of New Zealand implemented the Labour Relations Act of 1987, which shifted CB to the firm level. The German parliament passed a package of laws in 2002 to increase the flexibility of the labour market, weakening the force of collective agreements and workplace representation. Following the demands of the Troika (the European Commission, the European Central Bank, and the International Monetary Fund), the Greek government introduced a new CB law in 2011, which led to a complete decentralisation and widespread dissolution of industry-wide collective agreements.

Overall, poverty reduction and immigrants' labour market integration are vital goals to guarantee economic growth in the long run and facilitate inclusive and sustainable structural changes in the face of the green transition. In this regard, this doctoral thesis provides empirical evidence of the poverty-reducing effect of CB institutions through the channel of the welfare state. This thesis also shows that being born, studying and socialising in the host country leads to a reduction in immigrant-native gaps across generations, albeit not for all immigrant groups (e.g. immigrants from the Maghreb and/or immigrants working part-time). Therefore, as long as inequality and poverty remain structural problems of our societies, any research aimed at tackling them will be more than welcome.

**PART 4**  
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**PART 5**  
**APPENDICES**

## Appendices – Chapter 1: How collective bargaining shapes poverty: New evidence for developed countries

**Appendix 1. Collective bargaining components across developed countries in 1990 and 2015**

	Bargaining centralisation		Wage coordination		Bargaining coverage (%)		Trade union density (%)	
	1990	2015	1990	2015	1990	2015	1990	2015
Australia	4	2	4	2	77.3	62 <sup>a</sup>	41.3	14.6
Austria	3	3	4	4	98	98	46.8	27.4
Belgium	5	4	4	5	96	96	54	54.2
Canada	1	1	1	1	38	30.6	33.6	26.5
Denmark	3	3	4	4	82.8	83.1	73.9	67.1
Finland	5	4	4	4	85 <sup>a</sup>	89.3	72.6	66.5
France	3	3	2	2	94.6	98	10.7	9
Germany	3	3	4	4	85	56.8	31.2	17.6
Greece	5	2	3	1	100	21.3	35.2 <sup>a</sup>	20.2
Iceland	3	3	4	4	93.8 <sup>a</sup>	90	87.9 <sup>a</sup>	90
Ireland	5	3	5	4	62.8	32.5 <sup>a</sup>	51.1	25.5
Italy	3	3	1	3	100	80	39	35.7
Japan	1	1	5	4	25.3	17.5	25.4	17.5
Luxembourg	2	2	2	2	60	56.8 <sup>a</sup>	46.1	32.3
Netherlands	3	3	3	4	81.5	79.4	24.6	17.7
New Zealand	3	1	2	1	60	15.9	49.7	17.9
Norway	5	5	4	4	75	72 <sup>a</sup>	58.5	52.1
Portugal	4	3	4	2	78	73.7	29.3	16.1
South Korea	1	1	2	2	20.4	12.7	17.4	10
Spain	3	3	2	3	90.2	79.6	14.1	15.2
Sweden	3	3	3	4	91	88.7	81.5	61.8
Switzerland	3	3	4	3	49.2	44.6 <sup>a</sup>	23	15.7
United Kingdom	2	1	1	1	58	27.9	39.6	24.2
United States	1	1	1	1	18.2	12.3	15.5	10.6

*Notes:* <sup>a</sup> Missing values for bargaining coverage or trade union density in 1990 or 2015. The closest values are therefore used. Source: OECD/AIAS ICTWSS database.

## Appendix 2. Definitions and sources of control variables

- **Educational attainment** represents the percentage of people, aged 25-64, having an upper secondary or post-secondary non-tertiary education. Source: OECD Education Statistics.
- **Youth Population** is defined as those people aged less than 15. This indicator is measured as a percentage of the total population. Source: OECD Employment and Labour Statistics.
- **Children in unemployed single-parent households** measures the percentage of children, aged 0-14, who live in households where the sole adult is not in employment with respect to all single-parent households. In most cases, the one adult is one of the child's parents, but may also be another relative (for example, an older sibling or grandparent) or non-relative guardian. Source: OECD Family database.
- **Unemployment rate** is calculated by expressing the number of unemployed persons as a percentage of the total number of persons aged between 15 and 64 in the labour force. The labour force (formerly known as the economically active population) is the sum of the number of persons employed and the number of persons unemployed. Source: ILO database.
- **Inactivity rate** is the proportion of the working-age population that is not in the labour force (i.e. jobless, not available and/or not looking for a job). Source: ILO database.
- **Labour productivity growth** is the percentage change from a previous year in terms of labour productivity, which is defined as GDP per hour worked. Source OECD Productivity Statistics.
- **Output gap** is the difference between actual Gross Domestic Product (GDP) and potential GDP as a percent of potential GDP. Potential GDP is the level of output that an economy can produce at a constant inflation rate. Source: OECD National Accounts Statistics.
- **Inflation or consumer price index (CPI)** is defined as the change in the prices of a basket of goods and services that are typically purchased by specific groups of households. Source: OECD Main Economic Indicators database.
- **Short-term interest rate** (also called “money market rate” and “treasury bill rate”) is the rate at which short-term borrowings are effected between financial institutions or the rate at which short-term government paper is issued or traded in the market. Source: OECD Main Economic Indicators database.
- **Terms of trade** is defined as the ratio between the index of export prices and the index of import prices. If the export prices increase more than the import prices, a country has a positive terms of trade, as for the same amount of exports, it can purchase more imports. Source: OECD National Accounts Statistics.

### Appendix 3. Decomposition of public social spending by social branch, 1990-2015

Social branch	Mean (as a % of GDP)	Mean (as a % of public social spending)
Active labour market programmes (ALMP)	0.64	3.12
Family	5.60	27.26
Health	2.43	11.83
Housing	2.06	10.03
Incapacity-related benefits	0.37	1.80
Old age	6.85	33.35
Survivors	0.98	4.77
Unemployment	1.09	5.31
Other social policy areas	0.51	2.48
Total	20.54	100.00

*Notes:* The definitions of public social spending and its corresponding social branches are presented in Table 3. Source: OECD Social and Welfare Statistics.

#### Appendix 4. Pooled OLS estimator: bargaining coverage and bargaining centralisation

Dependent variable:									
	The incidence of low pay		Working-age poverty rate before taxes and transfers		Working-age poverty rate after taxes and transfers		Public social spending as a % of GDP		
	(1)		(2)		(3)		(4)		
Bargaining coverage	-0.131***		0.008		-0.051***		0.132***		
	(0.026)		(0.021)		(0.014)		(0.028)		
Trade union density	-0.111***	-0.167***	0.003	0.005	-0.030**	-0.042**	0.073**	0.124***	
	(0.026)	(0.037)	(0.023)	(0.021)	(0.013)	(0.018)	(0.031)	(0.043)	
Wage coordination	-0.374	-0.375	0.556	0.761	0.000	0.016	-0.392	-0.562	
	(0.543)	(0.778)	(0.437)	(0.566)	(0.219)	(0.358)	(0.246)	(0.610)	
Bargaining centralisation		-1.762**		-0.156		-0.716*		1.499*	
		(0.780)		(0.483)		(0.404)		(0.850)	
<b>Estimator</b>	<b>Pooled OLS</b>		<b>Pooled OLS</b>		<b>Pooled OLS</b>		<b>Pooled OLS</b>		
<b>Control variables<sup>a</sup></b>									
Demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Labour market characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Macroeconomic performance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Year fixed effects <sup>b</sup>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Observations	371	371	487	487	505	505	624	624	
Panel of countries	24 <sup>c</sup>		24		24		24		
Adjusted R-squared	0.76	0.66	0.69	0.69	0.70	0.63	0.78	0.63	

Notes: \*\*\*/\*\*/\* significant at the 1, 5 and 10% level. Clustered standard errors at the country level are denoted in parentheses. <sup>a</sup> Demographics: educational attainment, youth population and children in households where the sole parent is not in employment. Labour market characteristics: inactivity rate, labour productivity growth and unemployment rate. Macroeconomic indicators: inflation, output gap, short-run interest rate and terms of trade. <sup>c</sup> The following countries only show three available observations for the incidence of low pay: France, Norway and Sweden. Source: OECD, ILO, LIS, Eurostat and OECD/AIAS ICTWSS databases, 1990-2015.

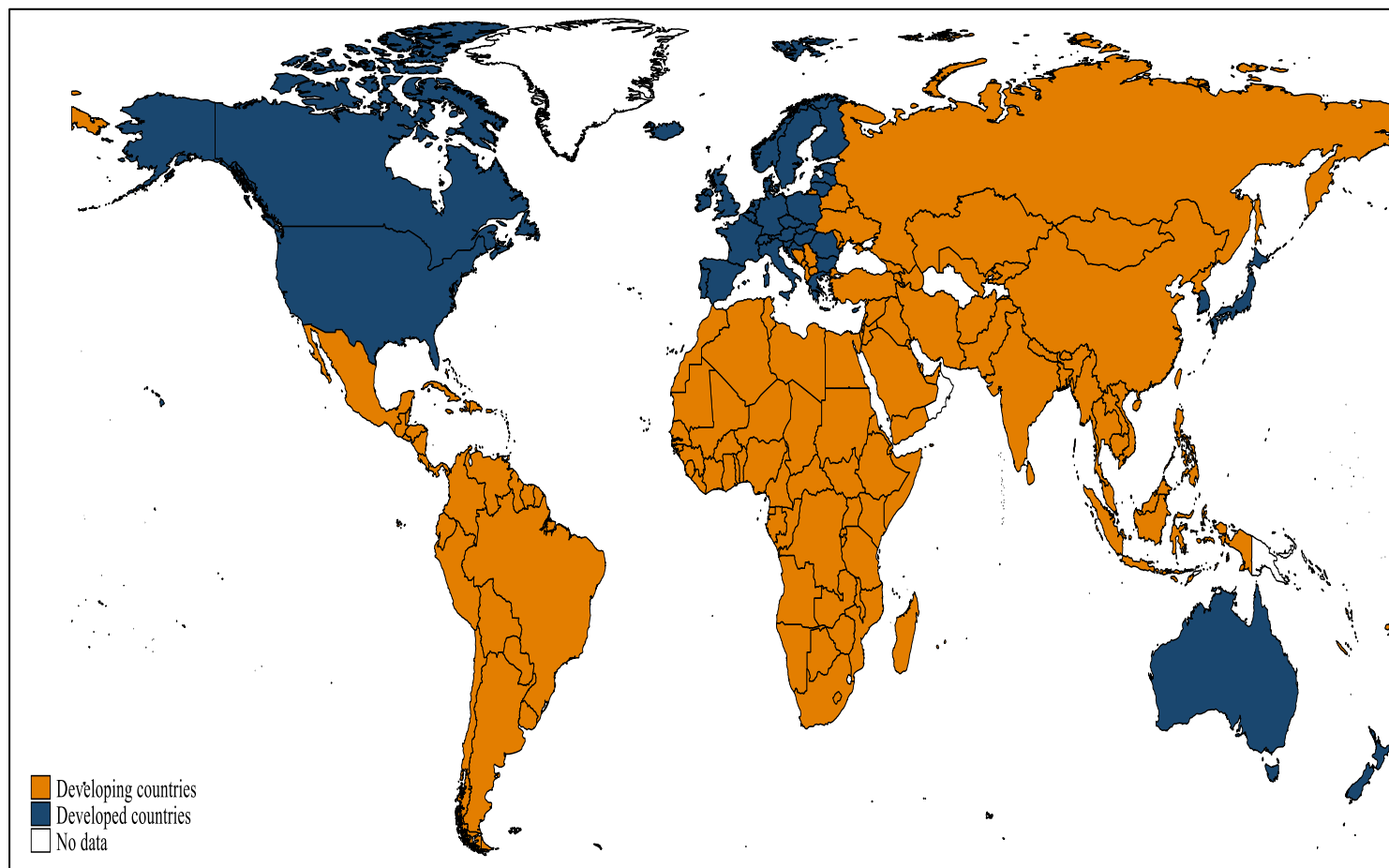
## Appendix 5. First-stage results of 2FE-2SLS specifications

Dependent variable (first-stage):	Trade union density			
Dependent variable (second-stage):	The incidence of low pay	Working-age poverty rate <i>before</i> taxes and transfers	Working-age poverty rate <i>after</i> taxes and transfers	Public social spending as a % of GDP
	(1)	(2)	(3)	(4)
Lagged trade union density	0.913*** (0.025)	0.902*** (0.023)	0.895*** (0.024)	0.904*** (0.020)
Average lagged trade union density in neighbouring countries	0.022 (0.025)	-0.043* (0.022)	-0.043* (0.022)	-0.006 (0.248)
<b>Estimator</b>	<b>2FE-2SLS</b>	<b>2FE-2SLS</b>	<b>2FE-2SLS</b>	<b>2FE-2SLS</b>
Other collective bargaining components <sup>a</sup>	Yes	Yes	Yes	Yes
<u>Control variables<sup>b</sup></u>				
Demographics	Yes	Yes	Yes	Yes
Labour market characteristics	Yes	Yes	Yes	Yes
Macroeconomic performance	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Year fixed effects <sup>c</sup>	Yes	Yes	Yes	Yes
Observations	361	477	495	600
Panel of countries	24 <sup>d</sup>	24	24	24
Within R-squared	0.97	0.96	0.96	0.97
Shea Partial R-squared <sup>e</sup>	0.88	0.89	0.89	0.90

*Notes:* \*\*\*/\*\*/\* significant at the 1, 5 and 10% level. Within standard errors, calculated by creating 1000 bootstrap samples, are reported in parentheses. <sup>a</sup> Collective bargaining components showing little within country-variation (i.e. bargaining centralisation, wage coordination and bargaining coverage) have been included as covariates. Corresponding regression coefficients are not reported in this table as their signal-to-noise ratio is too small to enable statistical inference. <sup>b</sup> Demographics: educational attainment, youth population and children in households where the sole parent is not in employment. Labour market characteristics: inactivity rate, labour productivity growth and unemployment rate. Macroeconomic indicators: inflation, output gap, short-run interest rate and terms of trade. <sup>c</sup> 25 year dummies. <sup>d</sup> The following countries only show three available observations for the incidence of low pay: France, Norway and Sweden. <sup>e</sup> The Shea Partial R-squared measures the instrument relevance by taking into account the intercorrelations between the excluded instruments and the endogenous regressor in question. Source: OECD, ILO, LIS, Eurostat and OECD/AIAS ICTWSS databases, 1990-2015.

## Appendices – Chapter 2: Moving up the social ladder? Wages of first- and second-generation immigrants from developing countries

Appendix 1: Chart of countries (IMF, 2019; United Nations, 2019)



*Notes:* Overseas territories are classified depending on their neighbouring countries. No data stipulates that no observation for workers born in or from these countries (Greenland (Denmark), Oman, Papua New Guinea, Tajikistan and Turkmenistan) is found in our database.

## Appendix 2: Natives and immigrants from developed countries: weighted multilevel log-linear regressions

Workers born in or from:	Log (Real gross hourly wage)	
	(1)	(2)
<b>Belgium</b> (n = 1,170,802)	Reference	Reference
<b>Developed countries<sup>a</sup></b>		
First generation (n = 86,481)	0.002 (0.008)	-0.002 (0.002)
Second generation (n = 114,923)	-0.040*** (0.004)	-0.005*** (0.001)
<u>Control variables</u>		
Year fixed effects <sup>b</sup>	Yes	Yes
Worker characteristics <sup>c</sup>	No	Yes
Employment characteristics <sup>d</sup>	No	Yes
Firm characteristics <sup>e</sup>	No	Yes
Occupations fixed effects (ISCO2) <sup>f</sup>	No	Yes
Sector fixed effects (NACE2) <sup>g</sup>	No	No
Firm fixed effects <sup>h</sup>	No	Yes
Observations	1,170,802	1,164,183
Adjusted R-squared	0.02	0.71

*Notes:* \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Robust standard errors are in parentheses, which are clustered at the firm level. Sample covers workers aged 15-64. Firm and worker weights are used. <sup>a</sup> S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. <sup>b</sup> 17 year dummies. <sup>c</sup> gender, age, squared age, educational attainment, tenure, squared tenure and type of household. <sup>d</sup> type of contract, dummy for part-time work, and dummy for overtime work. <sup>e</sup> Size of the firm (FTE number of workers in log), dummy for more than 50% privately owned, dummy for firm-level collective agreement and region where the firm is located (Brussels, Flanders or Wallonia). <sup>f</sup> 35 occupation dummies. <sup>g</sup> 64 sector dummies. <sup>h</sup> 17,990 firm dummies. Source: STATBEL, 1999-2016

### **Appendix 3: List of countries by geographical region in our database (IMF, 2019; United Nations, 2019)**

#### Developed countries

##### **Belgium**

**EU-14 countries<sup>a</sup>:** Austria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom.

**Other EU countries:** Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic and Slovenia.

**Other developed countries:** Andorra, Australia, Canada, Iceland, Japan, Liechtenstein, Monaco, New Zealand, Norway, Saint-Marin, Singapore, South Korea, Switzerland, Taiwan and United States.

#### Developing countries

**The Maghreb countries:** Algeria, Libya, Mauritania, Morocco and Tunisia.

**Sub-Saharan African countries:** Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central Africa Republic, Chad, Comoros, Congo, Congo DRC, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Reunion (French Department), Rwanda, Sao Tome and Principe, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe.

**Near and Middle Eastern countries:** Afghanistan, Bahrain, Egypt, United Arab Emirates, Iran, Iraq, Israel, Jordan, Kuwait, Pakistan, Palestine, Qatar, Saudi Arabia, Syria, Turkey and Yemen.

**Non-EU Eastern European countries:** Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kosovo, North Macedonia, Moldova, Montenegro, Russia, Serbia and Ukraine.

**Emerging and Developing Asian countries:** Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Fiji, French Polynesia (French Department), India, Indonesia, Kazakhstan, Kyrgyz Republic, Laos, Malaysia, Mongolia, Myanmar, Nauru, Nepal, North Korea, Nauru, New Caledonia, Philippines, Sri Lanka, Thailand, Uzbekistan, Vanuatu, Vietnam, and Wallis and Futana (French Department).

**Latin American and Caribbean countries:** Argentina, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Dutch Antilles, Ecuador, Grenada, Guadeloupe (French Department), Guatemala, Guyana, French Guyana (French Department), Haiti, Honduras, Jamaica, Martinique (French Department), Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Lucia, Suriname, Trinidad and Tobago, Uruguay and Venezuela.

<sup>a</sup> EU countries are defined as during the time span of the database (1999-2016). Therefore, the United Kingdom is still considered as an EU country.

#### Appendix 4. Descriptive statistics by origin and gender – means and percentages, 1999-2016

	Sample of workers born in or from						
	Developed countries		Developing countries <sup>a</sup>				
	Men	Women	First generation		Second generation <sup>b</sup>		
		Men	Women	Men	Women	Men	Women
Share of the sample by origin and gender (%) <sup>c</sup>	60.7	28.0	5.1	2.0	2.3	1.1	
<b>Region of birth (%)<sup>d</sup></b>							
<u>Developed countries</u>							
Belgium (n = 969,398)	83.8	82.7					
EU-14 countries (n = 179,765)	14.8	14.3					
Other EU countries (n = 17,018)	1.1	2.5					
Other developed countries (n = 4,621)	0.3	0.5					
<u>Developing countries</u>							
Maghreb countries (n = 50,175)			41.8	23.8	43.9	42.1	
Sub-Saharan African countries (n = 27,253)			18.4	20.2	22.2	25.5	
Near and Middle East countries (n = 25,444)			21.0	15.4	23.8	20.2	
Non-EU Eastern European countries (n = 12,419)			9.4	14.8	6.1	5.8	
Emerging and developing Asian countries (n = 8,979)			5.7	15.7	2.5	4.4	
Latin American and Caribbean countries (n = 5,777)			3.7	10.1	1.5	2.0	
<b>Worker characteristics</b>							
Real gross hourly wage (in EUR) <sup>e</sup>	21.3	18.2	17.4	15.4	17.9	16.3	
Age	38.7	37.2	38.4	37.5	30.5	29.7	
Tenure	9.6	7.8	5.6	3.8	4.2	3.5	
Education (%):							
At most lower secondary	29.9	26.7	50.5	51.9	31.1	25.9	
Upper secondary	42.3	41.9	36.5	32.5	46.0	43.2	
Tertiary	27.8	31.4	13.0	15.5	22.9	30.9	
Household (%):							
Single person	12.5	10.8	15.3	11.7	12.7	10.5	
Couple without children living at home	17.3	20.0	10.7	14.6	11.5	13.9	
Couple with children living at home	61.3	55.5	64.1	55.2	63.7	58.4	
Single parent	6.1	11.4	3.5	13.9	8.6	14.8	
Other households	2.8	2.3	6.5	4.6	3.5	2.5	
<b>Employment characteristics</b>							
Part-time work (%)	3.5	23.2	10.1	40.8	10.3	28.5	
Overtime work (%)	5.8	1.8	6.1	1.6	6.1	1.5	
Type of contract (%):							
Permanent	93.5	90.3	87.1	83.4	84.0	79.1	
Fixed-term	5.0	8.5	11.7	15.1	14.1	18.2	
Apprenticeship	0.2	0.3	0.1	0.1	0.5	0.9	
Internship	1.3	1.0	1.1	1.3	1.4	1.8	

Appendix 3. (Continued)

## Appendix 4. Continued

	Sample of workers born in or from						
	Developed countries		Developing countries <sup>a</sup>				
	Men	Women	First generation		Second generation <sup>b</sup>		
		Men	Women	Men	Women	Men	Women
Occupational categories - ISCO1 (%):							
Managers	5.0	2.9	1.6	1.4	2.3	2.7	
Professionals	13.1	11.5	5.6	6.3	11.2	11.2	
Technicians and associate professionals	10.3	8.9	4.6	4.1	9.0	10.0	
Clerical support	13.4	32.7	9.8	13.9	11.8	29.3	
Service and sales workers	6.5	17.1	8.2	13.8	11.2	23.1	
Craft and related trades workers	23.3	5.4	24.0	4.2	17.8	3.1	
Plant and machine operators and assemblers	20.2	7.3	19.9	3.7	22.6	3.7	
Elementary Occupations	8.1	14.2	26.3	52.7	14.2	17.1	
<b>Firm characteristics</b>							
Sector of activity - NACE1 (%):							
B - Mining and Quarrying	0.3	0.1	0.1	0.0	0.2	0.0	
C - Manufacturing	40.6	24.8	30.2	15.1	30.9	13.0	
D - Electricity, gas, steam and air conditioning supply	1.5	1.0	0.2	0.3	0.9	1.3	
E - Water supply, sewerage, waste management and remediation activities	1.0	0.6	1.0	0.4	0.7	0.3	
F - Construction	10.9	2.0	11.4	0.8	7.8	1.3	
G - Wholesale and retail trade, repair of motor vehicles and motorcycles	16.3	27.1	12.0	15.0	13.6	24.3	
H - Transportation and storage	10.5	7.5	11.7	3.2	14.2	6.7	
I - Accommodation and food service activities	1.7	4.1	7.5	11.6	4.7	7.0	
J - Information and communication	5.1	4.9	2.7	3.1	5.8	6.6	
K - Financial and insurance activities	0.9	1.8	0.7	2.2	1.2	2.5	
L - Real Estate activities	0.2	0.4	0.2	0.5	0.2	0.5	
M - Professional, scientific and technical activities	4.5	7.1	2.6	5.5	4.1	7.2	
N - Administrative and support service activities	6.6	18.6	19.8	42.1	15.8	29.2	
Size of the firm (FTE number of employees)	583.2	361.9	485.6	399.1	624.9	409.8	
Firm-level collective agreement (%)	28.9	24.2	23.8	15.9	31.2	22.9	
More than 50% privately owned (%)	93.7	94.4	96.6	97.2	93.4	95.9	
Region where the firm is located (%):							
Brussels	11.7	15.4	24.4	32.2	26.5	33.9	
Flanders	65.6	64.6	57.9	54.2	51.5	47.4	
Wallonia	22.7	20.0	17.7	13.6	22.1	18.7	

*Notes:* Sample covers workers aged 15-64. Worker and firm weights are used. a By 'developing countries', we actually mean either transition and developing countries listed in the United Nations' (2020) classification and/or emerging market and developing economies listed in the IMF's (2020) classification (See Appendix 1 for a chart of developed and developing countries). b S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. c The category 'Others' is also considered in the sample (0.8%). Therefore, the sum of shares in the table does not add up to 100%. d Appendix 2 shows the list of countries by region of birth. e At 2013 constant prices. It includes base pay, overtime compensation, performance-related pay and commissions, and annual and irregular bonuses. Source: STATBEL, 1999-2016.

### Appendix 5.1: Reweighted RIF-OB decompositions for MALE workers - Detailed composition effects

Reference group: male workers born in developed countries		Total composition effect (Quantity effects) <sup>a</sup>									Specification error (II)
		Total = (I) + (II)	Pure composition effect <sup>b</sup> (I)							Year fixed effects	
	Worker characteristics		Type of contract	Part-time	Overtime	ISCO2	Firm characteristics	NACE2			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<b>Counterfactual group: male workers from developing countries<sup>c</sup></b>											
25 <sup>th</sup> percentile	First generation	-0.089*** (0.001)	-0.032*** (0.001)	-0.005*** (0.000)	-0.004*** (0.000)	0.000*** (0.000)	-0.037*** (0.001)	-0.002*** (0.000)	-0.015*** (0.001)	0.003*** (0.000)	0.002 (0.002)
	Second generation	-0.124*** (0.001)	-0.103*** (0.001)	-0.006*** (0.000)	-0.004*** (0.000)	0.000*** (0.000)	-0.012*** (0.001)	0.005*** (0.000)	-0.009*** (0.001)	0.004*** (0.000)	0.002 (0.001)
50 <sup>th</sup> percentile	First generation	-0.110*** (0.001)	-0.048*** (0.001)	-0.004*** (0.000)	-0.001* (0.000)	0.000*** (0.000)	-0.056*** (0.001)	-0.002*** (0.000)	-0.013*** (0.001)	0.003*** (0.000)	0.010*** (0.001)
	Second generation	-0.127*** (0.001)	-0.109*** (0.001)	-0.004*** (0.000)	-0.001* (0.000)	0.000*** (0.000)	-0.016*** (0.001)	0.007*** (0.000)	-0.005*** (0.001)	0.003*** (0.000)	-0.001 (0.001)
75 <sup>th</sup> percentile	First generation	-0.188*** (0.002)	-0.068*** (0.001)	-0.002*** (0.001)	0.003*** (0.000)	-0.000* (0.000)	-0.093*** (0.002)	-0.001 (0.001)	-0.019*** (0.002)	-0.005*** (0.000)	-0.002 (0.002)
	Second generation	-0.178*** (0.002)	-0.138*** (0.001)	-0.001* (0.001)	0.003*** (0.000)	-0.000 (0.000)	-0.033*** (0.001)	0.007*** (0.001)	-0.010*** (0.001)	-0.005*** (0.000)	0.000 (0.002)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Bootstrap standard errors are in parentheses. Sample covers workers aged 15-64. Weights for firms and workers are used. <sup>a</sup> Total composition effect is the sum of a pure composition effect and a specification error. <sup>b</sup> The pure composition effect reflects the part of the overall wage gap attributed to differences in observables characteristics. <sup>c</sup> S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. Source: STATBEL, 1999-2016

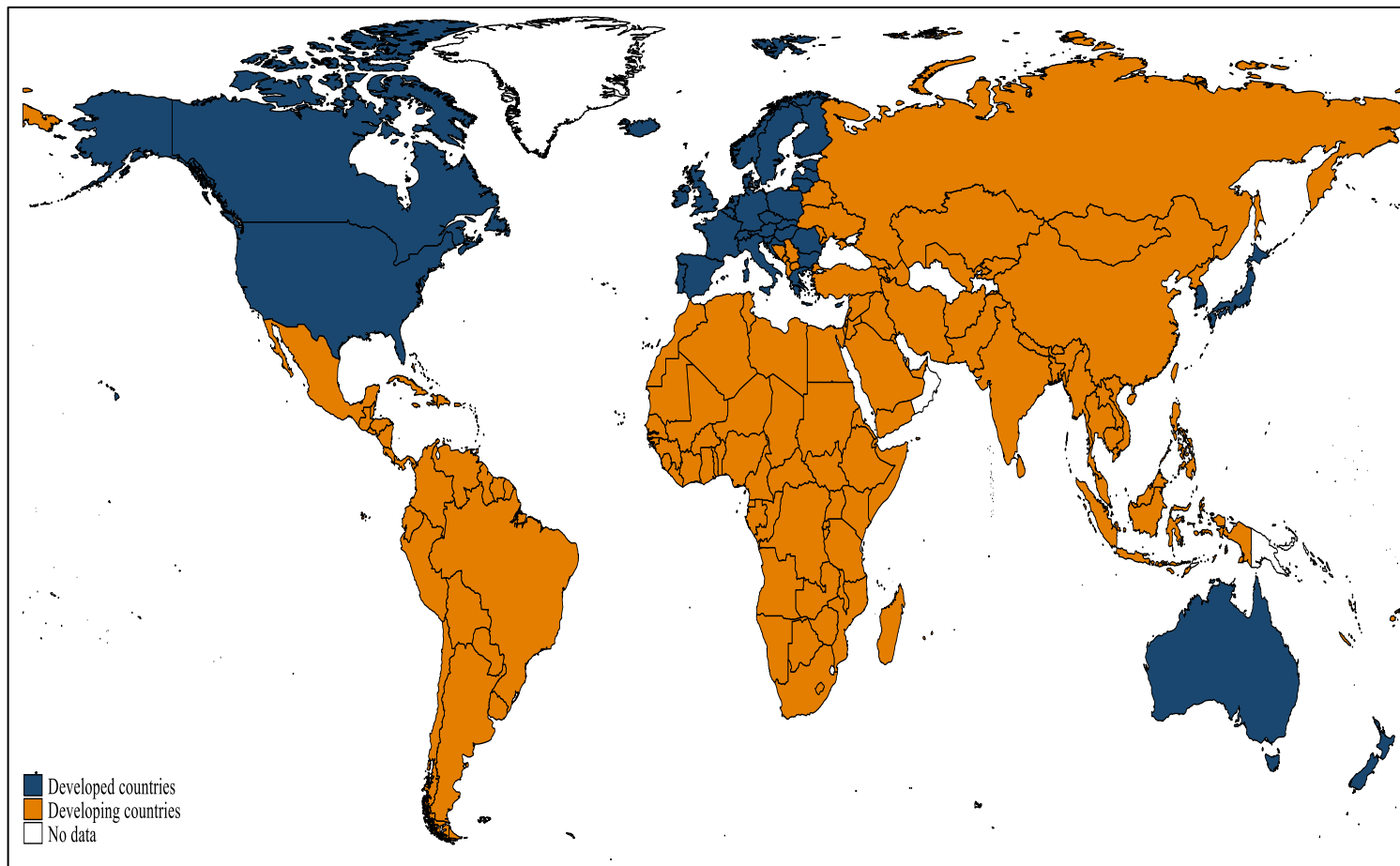
## Appendix 5.2: Reweighted RIF-OB decompositions for FEMALE workers - Detailed composition effects

Reference group: female workers born in developed countries		Total composition effect (Quantity effects) <sup>a</sup>									Specification error (II)
		Total = (I) + (II)  (1)	Pure composition effect <sup>b</sup> (I)								
			Worker characteristics (2)	Type of contract (3)	Part-time (4)	Overtime (5)	ISCO2 (6)	Firm characteristics (7)	NACE2 (8)	Year fixed effects (9)	
<b>Counterfactual group: female workers from developing countries<sup>c</sup></b>											
25 <sup>th</sup> percentile	First generation	-0.089*** (0.001)	-0.039*** (0.001)	-0.006*** (0.000)	-0.007*** (0.001)	-0.000** (0.000)	-0.083*** (0.003)	0.003*** (0.001)	-0.022*** (0.003)	0.013*** (0.001)	0.052*** (0.003)
	Second generation	-0.092*** (0.001)	-0.083*** (0.001)	-0.010*** (0.001)	-0.002*** (0.000)	-0.000*** (0.000)	-0.008*** (0.001)	0.003*** (0.001)	-0.007*** (0.001)	0.006*** (0.000)	0.009*** (0.002)
50 <sup>th</sup> percentile	First generation	-0.156*** (0.001)	-0.053*** (0.001)	-0.002*** (0.000)	-0.003*** (0.001)	-0.000** (0.000)	-0.093*** (0.003)	0.007*** (0.001)	-0.025*** (0.002)	0.008*** (0.001)	0.005*** (0.002)
	Second generation	-0.112*** (0.001)	-0.098*** (0.001)	-0.002*** (0.001)	-0.001*** (0.000)	-0.000** (0.000)	-0.004*** (0.001)	0.006*** (0.001)	-0.008*** (0.001)	0.003*** (0.000)	-0.008*** (0.002)
75 <sup>th</sup> percentile	First generation	-0.200*** (0.002)	-0.070*** (0.002)	0.002*** (0.000)	-0.003*** (0.001)	0.000 (0.000)	-0.080*** (0.003)	0.013*** (0.001)	-0.031*** (0.003)	-0.000 (0.001)	-0.032*** (0.002)
	Second generation	-0.117*** (0.002)	-0.109*** (0.002)	0.005*** (0.001)	-0.001*** (0.000)	0.000 (0.000)	-0.001 (0.001)	0.012*** (0.001)	-0.008*** (0.001)	-0.000 (0.000)	-0.015*** (0.002)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Bootstrap standard errors are in parentheses. Sample covers workers aged 15-64. Weights for firms and workers are used. <sup>a</sup> Total composition effect is the sum of a pure composition effect and a specification error. <sup>b</sup> The pure composition effect reflects the part of the overall wage gap attributed to differences in observables characteristics. <sup>c</sup> S-G immigrants' origin is defined based on the father's country of birth. However, if the father was born in a developed country and the mother was born in a developing country, the mother's country of birth is retained. Source: STATBEL, 1999-2016

## Appendices – Chapter 3: Immigrant overeducation across generations: The role of gender and part-time work

### Appendix 1: Chart of developed and developing countries



*Notes:* Overseas territories are classified depending on their neighbouring countries. No data stipulates that no observation for workers born in or from these countries (Greenland (Denmark), Oman, Papua New Guinea, Tajikistan and Turkmenistan) is presented in our database.

## **Appendix 2: List of countries by geographical region in our database**

### **Developed countries**

#### **Belgium**

**EU-14 countries<sup>a</sup>:** Austria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom.

**Other EU countries:** Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic and Slovenia.

**Other developed countries:** Andorra, Australia, Canada, Iceland, Japan, Liechtenstein, Monaco, New Zealand, Norway, Saint-Marin, Singapore, South Korea, Switzerland, Taiwan and United States.

### **Developing countries**

**The Maghreb countries:** Algeria, Libya, Mauritania, Morocco, and Tunisia.

**Sub-Saharan African countries:** Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central Africa Republic, Chad, Comoros, Congo, Congo DRC, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Reunion (French Department), Rwanda, Sao Tome and Principe, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe.

**Near and Middle Eastern countries:** Afghanistan, Bahrain, Egypt, United Arab Emirates, Iran, Iraq, Israel, Jordan, Kuwait, Pakistan, Palestine, Qatar, Saudi Arabia, Syria, Turkey and Yemen.

**Non-EU Eastern European countries:** Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kosovo, North Macedonia, Moldova, Montenegro, Russia, Serbia and Ukraine.

**Emerging and developing Asian countries:** Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Fiji, French Polynesia (French Department), India, Indonesia, Kazakhstan, Kyrgyz Republic, Laos, Malaysia, Mongolia, Myanmar, Nauru, Nepal, North Korea, Nauru, New Caledonia, Philippines, Sri Lanka, Thailand, Uzbekistan, Vanuatu, Vietnam and Wallis and Futana (French Department).

**Latin American and Caribbean countries:** Argentina, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Dutch Antilles, Ecuador, Grenada, Guadeloupe (French Department), Guatemala, Guyana, French Guyana (French Department), Haiti, Honduras, Jamaica, Martinique (French Department), Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Lucia, Suriname, Trinidad and Tobago, Uruguay and Venezuela.

<sup>a</sup> EU countries are defined as during the time span of the database (1999-2016). Therefore, the United Kingdom is still considered an EU country.

### Appendix 3. Descriptive statistics by origin – means and percentages

	Sample of tertiary-educated workers born in or from:	
	Developed countries <sup>a</sup>	Others <sup>b</sup>
Share of the sample (%)	13.8	1.1
Observations	54,524	4,509
<b>Region of birth (%)</b>		
Belgium	53.5	
<u>Developed countries<sup>c</sup></u>		
EU-14 countries	38.8	40.9
Other EU countries	4.0	0.0
Other developed countries	3.7	7.0
<u>Developing countries</u>		
Sub-Saharan African countries		46.8
Maghreb countries		1.7
Near and Middle Eastern countries		0.5
Emerging and developing Asian countries		0.7
Non-EU Eastern European countries		0.0
Latin American and Caribbean countries		2.4
<b>Worker characteristics</b>		
Women (%):	38.8	34.0
Age categories (%):		
20-24	3.7	0.0
25-29	16.1	2.4
30-39	38.5	10.3
40-49	26.9	28.3
50+	15.0	34.6
Tenure in years	7.1	24.5
Education (%):		
Bachelor	55.4	49.3
Master	40.7	47.3
Advanced Master or PhD	3.9	3.4
Household (%):		
Without children living at home	35.7	29.1
With children living at home	58.0	69.2
Other households <sup>d</sup>	6.3	1.8
<b>Employment characteristics</b>		
Type of contract (%):		
Permanent	94.7	96.2
Fixed-term	4.7	3.3
Internship or apprenticeship	0.6	0.6
Part-time work (%) <sup>e</sup>	4.4	4.9
Overtime work (%) <sup>f</sup>	1.6	1.4
Occupational categories - ISCO1 (%):		
Managers	15.5	15.9
Professionals	39.9	41.1
Technicians and associate professionals	15.6	16.4
Clerical support	20.8	19
Service and sales workers	3.9	3.9
Craft and related trades workers	1.8	1.6
Plant and machine operators and assemblers	1.6	1.6
Elementary Occupations	0.9	0.6

Appendix 3. (Continued)

### Appendix 3. Continued

	Sample of tertiary-educated workers born in or from:	
	Developed countries <sup>a</sup>	Others <sup>b</sup>
<b>Firm characteristics</b>		
Sector of activity - NACE1 (%):		
B - Mining and Quarrying	0.1	0.2
C - Manufacturing	26.5	25.4
D - Electricity, gas, steam and air conditioning supply	1.7	2.3
E - Water supply, sewerage, waste management and remediation activities	0.5	0.8
F - Construction	3	4.4
G - Wholesale and retail trade, repair of motor vehicles and motorcycles	18.1	18.6
H - Transportation and storage	4.8	5.6
I - Accommodation and food service activities	1.7	1.3
J - Information and communication	12.6	14.1
K - Financial and insurance activities	3.3	3.4
L - Real Estate activities	0.3	0.6
M - Professional, scientific and technical activities	16.2	13
N - Administrative and support service activities	8.8	7.5
P - Education	0.2	0.6
Q - Human Health and social work activities	1.7	1.9
R - Arts, entertainment and recreation	0.1	0.1
U - Other service activities	0.3	0.3
Size of the firm (FTE number of employees)	482.4	444.0
Firm-level collective agreement (Yes) (%)	27.5	27.5
More than 50% privately owned (%)	95.4	94.8
Region where the firm is located (%):		
Brussels	29.5	30.3
Flanders	41.4	47.3
Wallonia	29.2	22.4

Notes: Worker and firm weights are used in the calculation of means and percentages. <sup>a</sup> By "immigrants from developed countries, we mean first- and second-generation immigrants from developed countries. <sup>b</sup> By 'others', we mean workers born abroad with both parents born in Belgium (e.g. children of expatriates). <sup>c</sup> Appendix 2 shows the list of developed and developing countries by region of birth. <sup>d</sup> 'Other households' refer to brothers/sisters living together, friends living together, students or workers' homes, etc. <sup>e</sup> A worker is recognized as a part-time employee if he/she works less than 30 hours per week. <sup>f</sup> Overtime is when an employee works more than his/her contractual working hours. Source: STATBEL, 1999-2016.

## Appendix 4. Average marginal effects - OLS and OLOGIT regressions

Tertiary-educated workers born in/from:	Probability of being overeducated	
	(1)	(2)
<b>Belgium</b> (n = 311,222)	Reference	Reference
<b>Developing countries<sup>a</sup></b>		
First-generation (n = 14,459)	0.121*** (0.014)	0.094*** (0.011)
Second-generation (n = 11,748)	0.011 (0.010)	0.007 (0.007)
<b>Developed countries<sup>b</sup></b> (n = 54,524)	-0.039*** (0.006)	-0.025*** (0.004)
<b>Others<sup>c</sup></b> (n = 4,509)	0.008 (0.014)	0.007 (0.010)
<u>Estimator</u>	<b>OLS</b>	<b>OLOGIT</b>
<u>Control variables</u>		
Year fixed effects <sup>d</sup>	Yes	Yes
Worker characteristics <sup>e</sup>	Yes	Yes
Employment characteristics <sup>f</sup>	Yes	Yes
Firm characteristics <sup>g</sup>	Yes	Yes
Occupation-age-sector cells <sup>h</sup>	13,628	13,628
Observations	396,462	396,462

*Notes:* \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Worker and firm weights are used. Robust standard errors are in parentheses, which are clustered at the firm level. <sup>a</sup> Second-generation immigrants' origin is defined according to the father's country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother's country of birth is retained. <sup>b</sup> The group 'immigrants from developed countries' includes F-G immigrants born in developed countries and their S-G counterparts. <sup>c</sup> The group 'others' refers to workers born in developing countries with both parents born in Belgium. <sup>d</sup> 17 year dummies. <sup>e</sup> Gender, level of tertiary education, tenure, squared tenure and type of household. <sup>f</sup> Type of contract and dummies for part-time work and overtime work. <sup>g</sup> Size of the firm (FTE number of workers in log), dummy for more than 50% privately owned, dummy for a firm-level collective agreement and region where the firm is located (Brussels, Flanders or Wallonia). <sup>h</sup> Using a realized matches approach, overeducation is identified within each occupation-age-sector cell (see Section 3.1 for more details). Source: STATBEL, 1999-2016.

## Appendix 5. Shares of tertiary-educated workers (%) by type of diploma, 1999-2016

		Bachelor	Master	Advanced master or PhD
Tertiary-educated workers born in/from:		(1)	(2)	(3)
<b>Belgium</b>		57.6	39.7	2.7
<b>Developing countries<sup>a</sup></b>				
Sub-Saharan African countries	First generation	58.8	37.2	4.0
	Second generation	49.2	47.2	3.6
Maghreb countries	First generation	64.0	32.4	3.6
	Second generation	66.8	31.8	1.5
Near and Middle Eastern countries	First generation	57.6	39.0	3.4
	Second generation	69.1	30.1	0.7
Emerging and developing Asian countries	First generation	51.2	43.3	5.5
	Second generation	46.8	47.6	5.6
Non-EU Eastern European countries	First generation	55.3	40.8	3.9
	Second generation	59.8	36.4	3.9
Latin American and Caribbean countries	First generation	48.8	43.2	8.0
	Second generation	59.5	38.4	2.2

*Notes:* Worker and firm weights are used in the calculation of percentages. <sup>a</sup> Second-generation immigrants' origin is defined according to the father's country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother's country of birth is retained. Source: STATBEL, 1999-2016.

## Appendix 6. Part-time work and parenthood: average marginal effects – LOGIT regression

		Probability of being in a part-time job		
Tertiary-educated workers born in/from:		(1)	(2)	
<b>Belgium</b>				
Men	Without child(-ren) (n = 56,415)	Reference	Reference	
	With child(-ren) (n = 132,102)	-0.002*** (0.001)	-0.002* (0.001)	
Women	Without child(-ren) (n = 38,762)	0.031*** (0.002)	0.024*** (0.002)	
	With child(-ren) (n = 78,868)	0.102*** (0.002)	0.078*** (0.002)	
<b>Developing countries<sup>a</sup></b>				
Men	Without child(-ren)	First generation (n = 2,969)	0.034*** (0.005)	0.011*** (0.004)
		Second generation (n = 2,139)	-0.003 (0.003)	0.001 (0.004)
	With child(-ren)	First generation (n = 5,676)	0.028*** (0.004)	0.008*** (0.003)
		Second generation (n = 4,190)	0.008** (0.003)	0.012*** (0.004)
Women	Without child(-ren)	First generation (n = 1,840)	0.072*** (0.009)	0.042*** (0.006)
		Second generation (n = 1,779)	0.029*** (0.007)	0.031*** (0.006)
	With child(-ren)	First generation (n = 2,932)	0.144*** (0.009)	0.064*** (0.005)
		Second generation (n = 3,294)	0.068*** (0.007)	0.061*** (0.006)
<b>Control variables</b>				
Year fixed effects <sup>b</sup>		Yes	Yes	
Worker characteristics <sup>c</sup>		No	Yes	
Employment characteristics <sup>d</sup>		No	Yes	
Firm characteristics <sup>e</sup>		No	Yes	
Observations		386,555	386,555	

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Worker and firm weights are used in the LOGIT regression. Robust standard errors are in parentheses, which are clustered at the firm level. The groups 'immigrants from developed countries' and 'others' are also included in the regression but their gender-interacted estimates associated with or without having children are not portrayed in this table (available on request). Workers living in other types of households (e.g. brothers/sisters living together, friends living together, students or workers' homes) are not included in the regression <sup>a</sup> Second-generation immigrants' origin is defined according to the father's country of birth. However, if the father was born in Belgium and the mother was born in a developing country, the mother's country of birth is retained. <sup>b</sup> 17 year dummies. <sup>c</sup> age, level of tertiary education, tenure and squared tenure. <sup>d</sup> occupation, type of contract and dummy for overtime. <sup>e</sup> sector of activity, size of the firm (FTE number of workers in log), dummy for more than 50% privately owned, dummy for a firm-level collective agreement and region where the firm is located (Brussels, Flanders or Wallonia). Source: STATBEL, 1999-2016.