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Socioeconomic inequalities in education: public policies for resilience

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A mi familia, por valorar la educación y permitirme no tener límites.

Vosotros me habéis hecho resiliente.

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Resumen

En cumplimiento con el Artículo 7.2 del Reglamento sobre depósito, evaluación y defensa de la Tesis Doctoral de la Universitat de València se realiza el presente resumen en una de las lenguas oficiales de la Universitat.

La educación es la principal herramienta de que disponen los Estados y sus respectivos responsables políticos para aumentar la movilidad social (Ermisch & Francesconi, 2001a; OECD, 2018a), pues el sistema educativo es el principal engranaje del conocido como ascensor social. Este ascensor es el que permite a los individuos provenientes de entornos socioeconómicos desfavorecidos escalar a posiciones sociales más elevadas respecto de sus progenitores, es decir, dicho ascensor es especialmente relevante para la movilidad social ascendente. La falta de movilidad intergeneracional se explica a menudo utilizando el término "pegajoso", que significa que los individuos de las clases sociales más bajas sufren del denominado "suelo pegajoso", mientras que los de las clases sociales más favorecidas, disfrutan de un "techo pegajoso". Ello implica que aquellos que pertenecen a una determinada clase o estrato social tienen más probabilidades de permanecer en el mismo nivel socioeconómico en el que nacieron (OECD, 2018a), un fenómeno que afecta

más negativamente a los individuos más desfavorecidos, pues les dificulta mejorar sus condiciones sociales y económicas respecto de las de sus padres.

Por tanto, la educación es especialmente relevante para reducir la influencia negativa del origen socioeconómico en el futuro de los estudiantes en diversos aspectos: desde la calidad del empleo hasta su propia salud (Brunello et al., 2016; Bynner et al., 2002), pasando por el nivel de riqueza e incluso la satisfacción con la vida en general (Salinas-Jiménez et al., 2011). Es importante destacar que la desigualdad en el acceso a la educación parece superada en los países más desarrollados, dado que en los países de la OCDE cerca del 90% de los jóvenes de 4 a 17 años están escolarizados (OECD, 2018b), por lo que la atención debería centrarse en las diferencias en el rendimiento educativo de los estudiantes explicadas por el origen socioeconómico, que es, de hecho, el eje principal de esta Tesis Doctoral.

Es más, si no existe un sistema educativo donde el origen de los estudiantes esté en un segundo plano y que, por lo tanto, no defina de manera significativa su rendimiento educativo, es difícil que exista una igualdad de oportunidades real, por lo que podría ocurrir el conocido como efecto Mateo,[1] donde únicamente los socioeconómicamente favorecidos podrían sacar provecho real de la educación. Todo ello no solo tiene costes económicos y sociales individuales, sino que también afecta a las sociedades en su conjunto. Una sociedad en la que no existe un alto grado de

[1]El efecto Mateo es la denominación sociológica de un fenómeno de acumulación de riqueza, en este caso capital humano, según el cual el que más tiene es el que más acumula. El término tiene su origen en la parábola de los talentos del Evangelio de Mateo (también en el Evangelio de Lucas 19, 11-27): "Porque a cualquiera que tiene, se le dará, y tendrá más; pero al que no tiene, aun lo que tiene le será quitado". Mateo 13:12

igualdad de oportunidades es una sociedad con baja movilidad social, en la que el futuro de los individuos está prácticamente determinado por su origen familiar. Esto significaría que el capital humano estaría siendo infrautilizado y se estaría perdiendo tanto oportunidades de negocio como talento personal (Handl, 1985; OECD, 2018a). De hecho, la igualdad de oportunidades es uno de los objetivos adoptados por las Naciones Unidas en su programa de Objetivos de Desarrollo Sostenible, dado su objetivo número 10.3, que trata de garantizar la igualdad de oportunidades y reducir las desigualdades de resultado, y es también a su vez un pilar central del Informe sobre Desarrollo Humano de las Naciones Unidas.

La influencia del nivel educativo o la riqueza de los padres en el aprendizaje de sus hijos ha suscitado cierto interés en los economistas de la educación. El trabajo más destacado es sin duda el conocido como Informe Coleman (1996), que tuvo un gran impacto mediático en su momento (Coleman et al., 1966) y que sigue apareciendo hoy en día como uno de los grandes referentes en este campo. Su principal resultado evidencia que los alumnos de entornos socioeconómicos similares no solían mostrar un rendimiento educativo significativamente diferente, mostrando una clara falta de igualdad de oportunidades dentro del propio sistema educativo, pues el nivel socioeconómico de origen parecía una variable determinante. Esto dificultaría la labor de la educación como engranaje del ascensor social, pues los resultados educativos están correlacionados con el nivel socioeconómico del alumnado.

Roemer, uno de los pioneros en el uso del término "igualdad de oportunidades" en economía, sostenía que había dos fuentes de desigualdad, una relacionada con el

esfuerzo y otra con las circunstancias (Roemer, 1998). La única fuente legítima de desigualdad, según Roemer, sería la relacionada con el esfuerzo, ya que la idea de Roemer se basaba en que "a igual esfuerzo", sería justo, en sus propios términos, obtener "el mismo resultado". Para este autor, las circunstancias serían todo aquello que escapa al control de los individuos, en este caso de los estudiantes, siendo precisamente las que crean desigualdades ilegítimas y las que habría que reducir o eliminar. Es por ello que esta teoría ayuda a entender que las diferencias no son necesariamente siempre ilegítimas, ya que lo realmente relevante es cómo se han generado. Estas desigualdades inaceptables para Roemer causan, a su vez, dos tipos de desigualdades educativas diferenciadas: las primarias y las secundarias (Erikson & Jonsson, 1996; Müller, 2014). El primer tipo de desigualdad es el que surge del efecto directo del entorno socioeconómico sobre el rendimiento educativo, probablemente relacionado con el mayor apoyo recibido en el hogar o la mayor disponibilidad de recursos recibidos por los estudiantes en los hogares más favorecidos. Por su parte, las desigualdades secundarias se refieren a aquellas relacionadas con las diferentes decisiones tomadas por los estudiantes, dado un rendimiento educativo, en función de su entorno socioeconómico de origen. Es decir, dadas unas capacidades cognitivas no significativamente diferentes, los individuos tienden a tener preferencias distintas a consecuencia de la influencia de su entorno familiar.

Estas diferencias en el proceso de toma de decisiones están explicadas por la diferente disponibilidad de información en el hogar entre los estudiantes socioeconómicamente desfavorecidos y favorecidos, ya que la principal fuente de infor-

mación es precisamente la familia (Musset & Kurekova, 2018). Así, los estudiantes que proceden de familias en las que ningún miembro ha obtenido un título universitario probablemente no midan los costes y beneficios de la educación de forma similar a los que sí provienen de familias con miembros que han obtenido un grado universitario, debido, precisamente, a la asimetría de la información. Un buen ejemplo de esta diferencia en la toma de decisiones es el mayor desajuste entre el rendimiento educativo y las expectativas en los estudiantes desfavorecidos, pues tienden a presentar unas aspiraciones demasiado bajas respecto a su rendimiento educativo (Agasisti & Maragkou, 2022; Givord, 2020; Gore et al., 2015).

Para analizar la igualdad de oportunidades en el sistema educativo y sus determinantes e implicaciones de política pública, en esta Tesis Doctoral se utiliza el enfoque de la resiliencia educativa, que permite medir la igualdad de oportunidades y así aplicar técnicas estadísticas y econométricas. La resiliencia, término que hace referencia a la resistencia o capacidad para superar adversidades en contextos o situaciones difíciles, se utiliza en el campo de la economía de la educación para cuantificar de una forma más precisa la igualdad de oportunidades. Se considera que un estudiante es resiliente si, dada su situación socioeconómica de origen relativamente desfavorecida, consigue superar las adversidades y alcanzar un nivel educativo o un rendimiento académico superior al esperado. Por ello, se puede decir que una sociedad disfruta de una mayor igualdad de oportunidades cuando existe una cantidad elevada de estudiantes resilientes, dada una cantidad de alumnos desfavorecidos. Este concepto de resiliencia ha sido utilizado previamente (Agasisti &

Longobardi, 2014, 2017; Agasisti et al., 2017; Borman & Overman, 2004; Cordero & Mateos-Romero, 2021; Gordon Rouse, 2001; OECD, 2011, 2018b; Vicente et al., 2021; Wills & Hofmeyr, 2019), especialmente con los datos procedentes de PISA (*Programme for International Student Assessment*) a partir de las encuestas educativas realizadas por la OCDE a estudiantes de en torno a los 15 años. Este organismo ha impulsado, a su vez, el uso de la resiliencia para medir la igualdad de oportunidades a partir de sus propios informes (OECD, 2011, 2018b).

Gracias a la información que proporciona el enfoque de la resiliencia, se pueden aplicar metodologías econométricas y estadísticas para realizar un análisis riguroso de la igualdad de oportunidades en el ámbito educativo. Aunque en la presente Tesis Doctoral se aborden diferentes problemáticas relacionadas con la igualdad de oportunidades, lo que conlleva que las necesidades técnicas sean distintas, en todas ellas los métodos aplicados tienen un nexo común: los modelos multinivel. Estos modelos permiten controlar por el hecho de que algunos estudiantes pertenecen al mismo colegio o incluso al mismo país, aprovechándose a su vez de esa información. Esto es especialmente relevante porque los individuos, en este caso estudiantes, que pertenecen a un mismo grupo, como puede ser la escuela, comparten características no siempre observables y tienden a mostrar resultados correlacionados entre ellos. Es por esto por lo que, dadas las características y objetivos de esta Tesis Doctoral, enfocada en el sistema educativo, este tipo de modelos son especialmente relevantes y su utilización es en sí misma una aportación, aunque no la única.

Cabe mencionar también que en la presente Tesis Doctoral se aplican también

técnicas cuasiexperimentales cuando la cuestión a abordar así lo ha requerido, utilizando principalmente la metodología conocida como *Propensity Score Matching*. Esta metodología trata de simular, hasta cierto punto, un experimento, agrupando individuos en función de sus características observables, con una diferencia: unos han sido tratados con algún tipo de variable de tratamiento, mientras que el resto son observaciones de control, pues no han sido tratados o expuestos al experimento simulado.

Esta Tesis Doctoral se organiza en 6 capítulos dedicados principalmente al análisis de las desigualdades educativas y a la realización de propuestas de política pública, aunque tres de ellos, el tercero, cuarto y quinto, son los capítulos principales. El primero de los capítulos principales analiza los determinantes de la resiliencia, utilizando técnicas sofisticadas para redefinir de una manera novedosa, y más certera, los alumnos que pueden considerarse como estudiantes resilientes. Con este objetivo se utilizan técnicas multinivel para controlar por el diferente efecto que tiene el entorno socioeconómico en los diferentes países, la principal aportación metodológica de este capítulo, usando como variable dependiente los resultados en matemáticas. Por tanto, los resilientes son definidos en primera instancia en función de su rendimiento en matemáticas, aunque los resultados son robustos al uso de los resultados en ciencias o lectura como variables clave para definir a los estudiantes desfavorecidos que han superado las expectativas y que por ello, se definen como resilientes. La muestra está formada por estudiantes de aproximadamente 15 años pertenecientes al conjunto de países que forman la OCDE, pues se utilizan los resul-

tados de las encuestas PISA (2003-2018) como principal base de datos. De hecho, en la primera parte del capítulo se obtienen los porcentajes de alumnos resilientes por país y oleada, para realizar un primer ejercicio, comparando el gasto público y el porcentaje de resilientes a lo largo de los años entre los países de la OCDE participantes en la encuesta. Los resultados muestran que el gasto público en educación es únicamente significativo para los países con menores recursos económicos, también denominados países relativamente pobres. Este resultado, junto con alguna evidencia anterior (Agasisti et al., 2017; OECD, 2012, 2013), hace que se plantee el próximo ejercicio del mismo capítulo de manera separada en función de la renta per cápita de los países.

Una vez se conoce quienes son los estudiantes resilientes y se dividen los países en dos grupos (relativamente ricos y pobres), se analizan sus determinantes tanto a nivel individual como a nivel de país, lo que permite a este capítulo aportar diversas orientaciones de política pública. Los análisis se realizan a través de regresiones probit multinivel de tres niveles. Estos tres niveles están formados por los individuos, que están agrupados en escuelas y estas a su vez están agrupadas en países. La variable dependiente toma valor uno si el individuo es resiliente, cero en el otro caso, pues la muestra utilizada en estas regresiones es únicamente el alumnado socioeconómicamente desfavorecido, condición necesaria para ser clasificado como resiliente. Dado que los países se agrupan en dos grupos distintos en función de su renta per cápita y que se realizan los análisis por separado, los determinantes de la resiliencia se muestran de manera independiente y adaptada al desarrollo de los

países.

Los resultados generales a nivel individual apenas varían en ambos casos, aunque hay algunas diferencias interesantes que merece la pena señalar. En primer lugar, el sexo se muestra relevante en la probabilidad de ser resiliente, siendo este efecto más positivo y significativo en el caso de los hombres. Esto se debe probablemente al menor rendimiento, de media, de las mujeres en matemáticas (OECD, 2015). Además, ser inmigrante de primera o segunda generación tiene un efecto más negativo en los países relativamente pobres. Esto puede deberse a la forma en que cada sistema educativo trata a los inmigrantes y a la cantidad de recursos que se destinan a este fin, además de la diferente tipología de los mismos. También se observa que las variables denominadas como *soft skills* o habilidades transversales, como pueden ser la autoconfianza o la motivación, parecen ser menos importantes en los países con rentas per cápita más bajas, ya que no todas estas variables son significativas. En cualquier caso, el resultado confirma que las *soft skills* desempeñan un papel importante en la resiliencia educativa (García-Crespo et al., 2021; Sandoval-Hernández & Białowolski, 2016) y, por tanto, deberían tener un mayor protagonismo en la enseñanza. Sin embargo, las habilidades transversales pueden abordarse más fácilmente en las primeras etapas educativas, durante las cuales puede prestarse atención no solo a los alumnos desfavorecidos, sino también a sus familias y entornos (Heckman, 2011), que deben ser apoyados desde la etapa preescolar para que puedan ayudar a los niños a desarrollar estas habilidades que serán decisivas para su futuro (Agasisti & Cordero-Ferrera, 2013).

Por su parte, el efecto compañero, también conocido como *peer effect* en su terminología en inglés, es decir, la influencia del resto de compañeros, y sus niveles socioeconómicos en los resultados individuales, también es estadísticamente significativa (Robertson & Symons, 2003), afectando de manera positiva a la probabilidad de ser resiliente. Esto significa que para los estudiantes socioeconómicamente desfavorecidos, tener compañeros con orígenes socioeconómicos más favorecidos con los que compartir espacios tiende a aumentar su probabilidad de ser resilientes.

Respecto de las variables a nivel de país, se comprueba que el gasto público en educación solo es significativo para los países con menos recursos. Concretamente, en los países más pobres aumentar 1.000 dólares, medidos en paridad del poder adquisitivo, el gasto público en educación provoca un incremento de más del 5% en la probabilidad de ser resiliente. Ello, a su vez, puede explicar el menor peso que tienen las variables más intangibles, como la motivación, en la probabilidad de ser resiliente, ya que las otras limitaciones más tangibles pueden aparecer primero. Respecto de los países con mayores recursos, en estos no se encuentra una relación significativa entre el gasto en educación y la probabilidad de ser resiliente, resultado esperado dada la primera parte del capítulo. En estos países, los resultados muestran que no necesariamente se debe gastar más, sino que la inversión puede reorientarse hacia determinadas partidas de gasto para aumentar la resiliencia educativa. Una alternativa, como muestran las estimaciones, puede ser priorizar el salario del profesorado, pues para este conjunto de países un mayor salario de estos está relacionado de manera estadísticamente significativa con una mayor probabili-

dad de ser resiliente.

En la última parte de este capítulo se realizan una serie de simulaciones, con el gasto público para los países relativamente pobres y con el salario de los profesores en los países relativamente ricos, que permiten realizar de manera más robusta recomendaciones de política pública. En el primer conjunto de países, se observa que el gasto público en educación deja de ser relevante a partir de los 11.000$ por alumno en términos de paridad del poder adquisitivo. Esa cantidad representa un techo de gasto a partir del cual la inversión en educación pierde eficacia en términos de igualdad de oportunidades y comienzan a aparecer rendimientos marginales decrecientes a escala. En cualquier caso, lo que parece necesario para este conjunto de países es aumentar los recursos educativos disponibles, pues los resultados muestran una carencia de los mismos en estos países.

En los países con una renta per cápita relativamente alta, los resultados sugieren que el salario de los profesores debería aumentar para impulsar la igualdad de oportunidades. Esto significa que, especialmente por encima de un umbral mínimo de recursos, lo importante no es la cantidad de recursos, sino en qué partidas se invierten los ya existentes. En publicaciones anteriores (OECD, 2013), utilizando el rendimiento educativo en lugar de la resiliencia, se obtuvieron conclusiones similares, es decir, el gasto alcanza un techo tanto en excelencia como en igualdad. Siguiendo esta línea argumental, los salarios más altos de los profesores hacen que la profesión docente sea más atractiva para los candidatos mejor preparados y, además, son un indicador de la valoración que la sociedad hace de la enseñanza (OECD, 2013). Sin

embargo, al igual que ocurre con el gasto público por alumno, el rendimiento disminuye al aumentar el salario con respecto al PIB per cápita por encima de un determinado umbral, que se encuentra cuando el salario del profesorado representa 1,6 veces la renta media del país. Por encima de este punto, los responsables políticos podrían considerar no solo aumentar directamente el salario de los profesores, sino también crear incentivos claros, no necesariamente económicos, que tengan un mayor efecto sobre la motivación de los docentes, más allá de demostrar una mayor valoración, tanto social como económica, del trabajo de los docentes.

No hay dudas sobre el efecto positivo de la educación a largo plazo, en aspectos muy diversos, cuando los estudiantes se convierten en adultos, pero se sabe menos sobre los efectos económicos en la vida adulta de haber sido resiliente durante la etapa educativa. ¿Basta con que los alumnos socioeconómicamente desfavorecidos sean resilientes para alcanzar en la edad adulta las mismas condiciones de vida que los más favorecidos? El principal objetivo del segundo de los capítulos principales es, precisamente, responder a esta cuestión, dando un paso adelante respecto del capítulo anterior y también respecto de toda la literatura previa sobre resiliencia, pues se muestran los efectos en la vida adulta en términos salariales de haber sido resiliente durante la etapa educativa, definiendo la resiliencia de una manera novedosa, en este caso, en función del nivel educativo alcanzado.

El objetivo principal de este capítulo es, por tanto, comparar a los estudiantes desfavorecidos, pero resilientes, con los estudiantes socioeconómicamente favorecidos, en términos de salario por hora, para así analizar cómo la educación puede reducir

o eliminar las diferencias entre los estudiantes procedentes de diferentes entornos socioeconómicos. En este caso, los resilientes se definen de una manera novedosa, pero similar al anterior capítulo, pues la variable dependiente es el nivel educativo alcanzado. La muestra proviene de una base de datos construida a partir de una encuesta conocida como *European Union Statistics Income and Living Conditions* (EU-SILC) entre los años 2005 y 2019 para la UE-28. Esta base de datos permite conocer tanto el salario por hora y otras características personales en el presente, como el origen socioeconómico de esos mismos individuos cuando tenían aproximadamente 14 años, aunque únicamente en las oleadas de 2005, 2011 y 2019, que son las que se utilizan en este capítulo. Se aplican los modelos multinivel conocidos como híbridos, pues se tiene en cuenta a qué oleada de la encuesta y país pertenece cada observación. Por tanto, son modelos de tres niveles, donde el primero son los individuos, el segundo es la combinación de oleada-país y el tercero son los países, lo que significa que, en el segundo nivel, por ejemplo, existen tres grupos que representan a España: España-2005, España-2011 y España-2019, mientras que el nivel tres agrupa a los tres en un único grupo, que en el caso del ejemplo sería un único grupo para España.

Los resultados muestran que, una vez controladas todas las variables observables, existe una diferencia de más del 5%, en términos de salario por hora, a favor de los individuos más favorecidos respecto de los resilientes. Las variables por las que se controla son el sexo, la nacionalidad, el sector de actividad, el tipo de ocupación, el estado civil, el nivel educativo y el tipo de jornada laboral. Sin embargo, las difer-

encias significativas únicamente aparecen cuando se controla por el nivel educativo. Por lo tanto, la educación es útil para mejorar el futuro de los estudiantes desfavorecidos, pero no consigue eliminar las desigualdades socioeconómicas de manera completa. Esta diferencia se puede explicar por las disparidades en la información, los contactos o el tipo de competencias alcanzables en un hogar con un alto capital humano respecto de uno con bajo nivel educativo. A esta diferencia o residuo no observable se le denomina durante el capítulo como "techo de cristal", pues a pesar de la mayor inversión y esfuerzo dedicado por parte de los resilientes en términos relativos, estos se encuentran con un techo no observable que, de media, no consiguen romper. Además, el efecto de este techo de cristal puede estar infravalorado, ya que se mide exclusivamente en términos de salario. Teniendo en cuenta que el salario representa una proporción menor de la renta total en los individuos más favorecidos, el techo de cristal que deben romper los individuos desfavorecidos para alcanzar el mismo nivel de renta y riqueza de los más favorecidos podría ser mucho mayor.

En este mismo capítulo también se comparan a los desfavorecidos que consiguieron ser resilientes con aquellos que no lo consiguieron. Considerando el nivel educativo de los dos grupos, se espera, por razones obvias, que los resilientes, dado su mayor nivel educativo, tenga mayores salarios por hora. No obstante, los resilientes también han mostrado ciertas competencias transversales, dado que han superado las adversidades de su entorno (Vicente et al., 2021). Es por ello por lo que, una vez se controle por el nivel educativo, que es la mayor diferencia observable entre ambos tipos de individuos, puede que los resilientes tengan alguna especie de

residuo positivo que muestre el efecto de estas habilidades en términos de salario por hora. Sin embargo, los resultados no muestran ninguna diferencia significativa entre ambos tipos de individuos una vez se incluye el nivel educativo en el modelo. Ello no significa que los resilientes no tengan ciertas habilidades transversales o que esas habilidades no sean valoradas en el mercado laboral, pues podrían facilitar una mayor calidad del empleo o incluso una mayor estabilidad laboral, consecuencias que exceden el objetivo del capítulo. Además, el efecto de ser resiliente podría ser absorbido por el resto de variables explicativas, pues el comportamiento de los resilientes a la hora de escoger sector de actividad o jornada laboral puede ser distinto a aquellos desfavorecidos no resilientes.

Volviendo a las diferencias entre individuos de diferentes entornos socioeconómicos y junto con los argumentos aportados anteriormente, queda claro cómo de importante es la información y la orientación recibida por los estudiantes en su entorno familiar a la hora de explicar las desigualdades, es decir, la desigualdad informativa parece tener una relación fuerte con la desigualdad socioeconómica, tanto dentro como fuera del sistema educativo. El último de los tres capítulos principales de esta Tesis Doctoral se centra, precisamente, en estudiar cómo esta desigualdad informativa puede tratar de reducirse dentro del sistema educativo a través del uso de determinadas políticas públicas y educativas. La política que se analiza es la provisión de orientación educativa profesional en la escuela al estudiantado de 15 años para la muestra de los países de la OCDE. Para ello se utiliza como base de datos principal la encuesta PISA 2018, que aporta por primera vez información específica

sobre la disponibilidad de orientación educativa, que no parece haber sido explotada con anterioridad. Dada la escasa evidencia previa (Hughes et al., 2016; Kashefpakdel & Schleicher, 2017), se parte de la hipótesis de partida de que proporcionar información y orientación a los estudiantes, además de estimularles en su proceso de aprendizaje, podría hacerles más conscientes de lo importante que es la educación, mejorando así su rendimiento académico. Sin embargo, como se ha comentado anteriormente, no todos los estudiantes tienen el mismo nivel de información disponible, por lo que el efecto de esta política educativa puede ser heterogéneo dependiendo del origen socioeconómico de cada individuo. Para llevar a cabo dicho análisis se aplica una metodología cuasiexperimental conocida como *Propensity Score Matching*, que tiene como variable de tratamiento el hecho de tener un orientador u orientadora empleado en la escuela. Una vez se crea el grupo de tratamiento y de control y se agrupan a los estudiantes en función de sus características observables, se utilizan modelos multinivel de tres niveles (individuo, escuela y país) para estimar el efecto o la relación entre el tratamiento y las diferentes variables de interés, que serán las variables a explicar.

En este último capítulo principal se encuentra una relación heterogénea entre la presencia de un orientador empleado en el centro escolar y el rendimiento educativo, siendo únicamente significativo para el alumnado socioeconómicamente más desfavorecido, tanto en matemáticas como en ciencias y lectura. Este resultado podría parecer poco intuitivo, pues el departamento de orientación no suele impartir clases en general, y menos en matemáticas, ciencias o lectura. Por otra parte, la provisión

de orientación también está relacionada fuertemente con la mejora de la motivación intrínseca y las expectativas de futuro, pero una vez más, únicamente para el estudiantado más desfavorecido. Por tanto, lo que se espera es que, al motivar a este estudiantado desfavorecido, haciéndoles más conscientes de sus posibilidades de futuro y de cómo de importante es estudiar, haga mejorar sus resultados académicos. Por tanto, esta política pública está estrechamente relacionada con la mejora en la igualdad educativa, a través de la provisión de información a aquellos que más lo necesitan, los estudiantes desfavorecidos, que son precisamente los que más carencias de información pueden tener en sus hogares. De hecho, el efecto de esta política parece ser mayor cuanto más desfavorecidos son los individuos, repitiéndose dicho patrón en todas las variables estudiadas.

Por otra parte, este mismo capítulo también proporciona un análisis de la heterogeneidad del efecto de esta política pública en función de las características de los países, siguiendo la metodología aplicada en el primero de los capítulos principales, de modo que se crean dos grupos de países en función de su renta per cápita. Para los países económicamente más desfavorecidos, la orientación profesional es importante para todo tipo de estudiantes, independientemente de su estatus socioeconómico, mientras que para los países económicamente más favorecidos, el patrón es el mismo que el anterior: únicamente relevante para los más desfavorecidos y, cuanto más desfavorecidos, más importante es la provisión de la figura del orientador. Esto puede explicarse tanto por el diferente valor que se le puede otorgar a la educación en función de las características de los países, como por la menor disponibilidad

de información académica en términos generales. Así pues, en este caso, aunque el efecto no es el mismo, las recomendaciones de política pública podrían ser las mismas, pues los efectos son positivos y significativos en ambos conjuntos.

Con todo ello, parece claro que los países y sus responsables políticos deberían hacer más hincapié en la igualdad de oportunidades dentro del propio sistema educativo, por razones tanto económicas como de justicia social. No obstante, en la actualidad, tanto los medios de comunicación como el mundo de la política y la academia se han centrado más en el rendimiento académico general, buscando la excelencia educativa, especialmente a partir de la popularización de los resultados PISA. Sin embargo, la educación debería tener por objetivo tanto la búsqueda de la excelencia como la de la igualdad.

Es por eso que la presente Tesis Doctoral busca poner en el foco la igualdad de oportunidades educativa, pues se entiende como condición necesaria para que exista igualdad de oportunidades en términos generales en el conjunto de las sociedades. Esto se realiza a través de un análisis estadístico y econométrico de los datos, para así aportar evidencia y analizar en qué punto se encuentran los países, tanto de Europa, como de aquellos pertenecientes a la OCDE. Los resultados muestran que aún existe capacidad de mejora en términos de igualdad de oportunidades educativas. Además, también se aporta evidencia sobre los efectos de determinadas políticas públicas, considerando las diferentes realidades dentro de un conjunto relativamente homogéneo como son los países más desarrollados.

Contents

Chapter 1

Introduction

1.1 Education as investment: benefits and externalities

Education is understood as a key element for today's societies, especially for the most advanced countries in economic, political and social terms for which it can represent a lever for growth, while for the rest of the countries it is a necessary condition for development. However, the origins of the economics of education, the field where this Doctoral Thesis is located, are relatively recent and are related to the creation of the human capital theory, created and popularised by Theodore Schultz (Schultz, 1960) and also by Jacob Mincer (Mincer, 1958) and Gary Becker (Becker, 1964). This theory defined education as an investment for the first time, assuming that education can increase individuals' productivity, with all the expected

positive effects. Thus, as any other investment, individuals forgo income today to earn higher incomes in the future. The assumption of education as a tool to learn and improve agents' abilities was also made almost two hundred years before by the considered father of modern economics, Adam Smith, who argued in The Wealth of Nations (1776) that one of the sources of human capital was education, making workers more economically productive, while innate abilities contribute very little to that (Spengler, 1977).

Human capital theory, the most widely accepted, is usually opposed to the signalling theory, according to which firms have less information than workers about their productivity and use workers' acquisition of education as a signal of higher productivity (Spence, 1978). Then, the fundamental difference is that education is considered a signal by the signalling theory, so education by itself does not make agents more productive since productivity depends on individuals' innate abilities, and education is proof of those qualities.

In any case, beyond the relationship between education and productivity, both theories relate more education to positive individual effects, although for different reasons. From an individual's income benefits point of view, that the more educated people tend to have higher incomes than the less educated is widely accepted (Card, 1999; Heckman et al., 2018; Walker & Zhu, 2013). However, Jacob Mincer's relevant contribution with his 'Mincer equation' must be mentioned (Mincer, 1974; Mincer, 1958) by his impact on the research on economics and the relevance of the author, considered as a microeconomics pioneer (Rosen, 1992). In their seminal works, the

years of schooling were used as an earnings determinant, connecting the modern human capital theory with empirical data (Rosen, 1992). Moreover, education increases the probability of economic success in more general terms (Allmendinger & Leibfried, 2003; Hout, 2012; Pastor et al., 2012) with a positive impact on employment (Hogarth et al., 2007; OECD, 2022).

In terms of non-monetary benefits, it should be noted that a higher level of education is more than a deeper knowledge in a specific area, as the learning process is often cross-cutting. The most educated people tend to enjoy better health, both physically and mentally (Brunello et al., 2016; Bynner et al., 2002) given their better habits (Miyamoto & Chevalier, 2010), extending their life expectancy (OECD, 2021). In general, education can be seen as a tool to improve well-being, encouraging life satisfaction (Salinas-Jiménez et al., 2011). Hence, the effects of education go beyond wages or employment, i.e. easily measurable features, having an impact on countless matters.

All these benefits could lead the reader to understand education as an investment with private returns only, and that the risk of such an investment should therefore be taken only at the individual level, without any kind of public intervention. However, the social benefits or positive externalities must also be considered. A country with a highly educated population tends to have more tax collection (Pérez et al., 2015), higher economic growth (Hanushek & Woessmann, 2010) and better innovation capacity (Crosling et al., 2015), among others.

In addition, there are also positive externalities that are not directly linked to

the economy, i.e. non-monetary externalities, based on the particular behaviour shown by the more educated population. In a society where the population is highly educated, people tend to be more tolerant (Borgonovi & Miyamoto, 2010; Bynner et al., 2002), but also more open to change, with higher levels of trust, greater awareness of equity and fewer problems arising from insecurity (Lochner & Moretti, 2004; Vorhaus et al., 2008), with a stronger and more participatory democracy (OECD, 2018a; Pastor et al., 2012). Consequently, education serves a political purpose, as it enables the population to have more information and to make more informed political decisions.

Therefore, education positively affects both countries and their inhabitants, and not only in monetary terms, since the effects go beyond money. Educated people tend to have higher incomes and better physical and mental health, which leads to countries having higher economic growth and more open and democratic societies, positively affecting the entire society, even those who have not been able to benefit directly from education.

1.2 Educational inequalities: socioeconomic background's role

The use of the concept "externality", in the positive sense, could imply that, without any public intervention, the market does not produce enough quantity, i.e. less than the optimal one to maximize social welfare. It follows that in the absence of public

intervention, the most advantaged individuals would have access to education, while the population belonging to more socioeconomically disadvantaged groups could be excluded. This idea with the above arguments can lead to think that there are social welfare reasons to justify public intervention in the education sector. Though, in addition, reasons for social justice cannot be ignored. Denying education to those who cannot afford it would mean denying all the above-mentioned individual and social benefits, with direct effects on their living conditions throughout their life cycle. Even though that access to education seems to be guaranteed in OECD countries, with around 90% of young people aged 4 to 17 enrolled in school (OECD, 2018b), socioeconomic inequality is still present inside education. Given that there are two kinds of inequalities, one has to do with access and the other with outcomes, the focus should be on differences in student performance or attainment explained by the socioeconomic background, i.e. on the second one, that it is, indeed, the main axis of this Doctoral Thesis.

A society where there is not a high degree of equality of opportunity is a society with low social mobility, with sticky floors and ceilings (OECD, 2018a), where the future of individuals is practically determined by their family background. The socioeconomic situation of children would be easily predictable with that of their parents, repeating the pattern generation after generation. Apart from the ethical reasons to reduce this inequality, there are also relevant economic justifications related to the fact that human capital is underutilised (Handl, 1985; OECD, 2018a) with both business opportunities and personal talent being lost. This is why edu-

cation is an essential cross-cutting element for all societies and is also considered a priority to make the "social elevator" between the different generations work (Ermisch & Francesconi, 2001b; OECD, 2018a), bringing society closer to the sometimes longed-for, but also controversial, meritocracy. Moreover, the equality of opportunity is one of the goals adopted by the United Nations in its Sustainable Development Goals programme with the 10.3 goal called "Ensure equal opportunities and end discrimination", which aims to ensure equality of opportunity and reduce inequalities of outcome, and it is also a central pillar of the United Nations Human Development Report.

The influence of parents' educational attainment or wealth, on their offspring's learning, has been of great interest to economists of education, although the most prominent work is undoubtedly the so-called Coleman Report (1996), which had a great media impact on the time (Coleman et al., 1966). This report was produced by the social concern about the educational results obtained by students at the end of the 1990s in the United States, and is the result of a project in which a large collection of data was carried out, with more than 600,000 students grouped in more than 3,000 schools. The main finding was that students from similar socioeconomic backgrounds tended to perform not significantly different in education.

Coleman and co-authors' result shows a lack of equality of opportunity within the education system itself, hindering its work as the main cog in the "social elevator". Roemer, on the other hand, argued in 1998 that there were two sources of inequality, one related to effort and the other to circumstances (Roemer, 1998). The

only legitimate source of inequality would be that related to effort, since Roemer's idea was based on the concept that for an "equal effort", it would be fair, in its own terms, to obtain "the same result". Circumstances are, for Roemer, everything beyond the control of individuals, in this case students, and are precisely those that create illegitimate inequalities and the ones that should be reduced or eliminated. It is true that differentiating between "effort" and "circumstances" is not always straightforward, since biological and genetic differences must be taken into account, which are an additional source of inequality. However, this theory helps to understand that differences are not necessarily illegitimate, since what is really relevant is how they have been generated.

These illegitimate inequalities cause, in turn, primary and secondary inequalities in education (Erikson & Jonsson, 1996; Müller, 2014). The first type of inequality is that which arises from the direct effect of the socioeconomic background on educational performance, through better cognitive skills, probably related to the greater support received at home, in addition to the greater availability of both financial and non-financial resources.

Secondary inequalities show how the decision-making process differs between individuals with similar educational performances, resulting in different returns to education. That is, given similar cognitive skills, individuals have different preferences as a consequence of the influence of their family environment.

Bearing in mind that the main source of information for students is the family (Musset & Kurekova, 2018), there is an unequal influence on the future of individu-

als, depending on the socioeconomic stratum from which they come. Thus, students who come from backgrounds where no member of the household has obtained a college degree are not likely to measure the costs and benefits of education similarly to those who have a college relative, because of the asymmetric information.

One of the clearest examples of informational inequality is that the mismatch between educational performance and future expectations is more prevalent in the most socioeconomically disadvantaged backgrounds (Givord, 2020). This means that disadvantaged students who have demonstrated relatively superior cognitive abilities tend not to envisage a future career commensurate with their excellent performance (Agasisti & Maragkou, 2022; Gore et al., 2015). Another example could be the greater presence of early school leavers among students with lower economic resources, largely explained by the lower educational attainment of their parents (Cairns et al., 1989).

This unequal distribution of information can also be seen in terms of capital following Bourdieu's arguments (Bourdieu, 1986), which argue that students from different socioeconomic backgrounds have different social and cultural capitals and then, take different decisions. He defines three kinds of capital: economic, social, and cultural, even though the two most relevant in this case are the latter two. Bourdieu understands as cultural capital, those inherited cultural competencies that have three forms: the embodied one, i.e. enduring dispositions of the mind and body, the objectified one in the form of books or pictures and the institutionalized one, related to the official educational qualifications (Bourdieu, 1986). The social

capital can be understood directly as inherited connections, that also can affect the students' decision-making process (Bourdieu, 1986).

In order to translate those socioeconomic inequalities into numbers and data for measuring reasons, the main approach used in this Doctoral Thesis is the resilient one. Resilience, a term that refers to the resistance or capacity to overcome adversities in difficult contexts or situations, has been used in the economics of education field to measure the equality of opportunities. A student is considered as resilient if, given his relatively disadvantaged socioeconomic status of origin, manages to overcome adversities and achieve a higher level of education or academic performance than expected. From a more country level perspective, the percentage of resilient students can be also used as a proxy variable of how is the effect of the of socioeconomic status during the education stage, giving information about how is the equality of opportunity inside the education system.

The concept of resilience in education has been used previously in the literature (Agasisti & Longobardi, 2014, 2017; Agasisti et al., 2017; Borman & Overman, 2004; Cordero & Mateos-Romero, 2021; Gordon Rouse, 2001; OECD, 2011, 2018b; Vicente et al., 2021; Wills & Hofmeyr, 2019) and has been used to analyse equality of opportunities in the educational context, frequently based on the PISA survey (Programme for International Student Assessment) conducted by the OECD, using the academic performance and the socioeconomic status index to define resilient students. The first educational studies of this century about resilience, as it is understood in this Doctoral Thesis, were based in the United States (Borman &

Overman, 2004; Gordon Rouse, 2001), but the popularisation of this term in the last years started mainly with the OECD documents and the use of the PISA survey (OECD, 2011, 2018b).

Therefore, resilience is the main focus of this Doctoral Thesis to assess the educational equality of opportunity, where the concept is redefined and extended from education to adulthood. Furthermore, public policy implications are also present throughout the document, aiming to increase the percentage of resilient students, and thus improve equality of opportunity within the education system. However, resilience is a means to an end and not an end in itself: resilient students represent the success of the education system in terms of socioeconomic inequalities where socioeconomic backgrounds have not determined educational performance, i.e. they are a proxy variable of the educational equality, the main interest of this Doctoral Thesis.

1.3 Chapters overview

This Doctoral Thesis uses a large amount of anonymous microdata coming from different databases, applying relatively complex econometric and statistical techniques. All of these techniques, used in the following chapters, are explained in chapter two, which is dedicated to the methodology.

The main body of this document is located between chapters three and five, where the main contributions related to the equality of opportunity in education

and the public policies to achieve it can be found. However, chapters three and four are more focused on resilience, with chapter three analysing the determinants of resilience, including public expenditure, while chapter four studies the effect of have been resilient in education on wages during adulthood. Meanwhile, chapter five examines the effect of a specific public and educational policy aimed at reducing educational inequality: the provision of career guidance counseling, only relevant to socioeconomically disadvantaged students. However, all of them are focused on educational equality in terms of the students' socioeconomic background of origin.

Chapter three defines in a more precise way than in the past which are the resilient students, considering the heterogeneous effect of the socioeconomic background in each different country, all of them inside the OECD, since the databases used are the PISA waves from 2003 to 2018. Given that definition, the percentage of resilient students is compared along these OECD countries, showing that public expenditure is only relevant for the relatively poorer countries. Then, resilience's determinants are studied, differentiating between two groups of countries in terms of GDP per capita: the relatively poor and rich. This more micro approach also shows that expenditure is relevant only for relatively poor countries (to a certain extent), a result in line with the reduced previous evidence (Agasisti et al., 2017), while for the other group of countries it is more important how the expenditure is distributed, where teachers' salary should be highlighted.

Chapter four represents an extension or even a next step of the previous chapter and also of the resilience literature, moving from education to wages during adult-

hood. The main motivation of this chapter is to analyse the effect of have been resilient in education on wages during adulthood, comparing students from different socioeconomic backgrounds, i.e. disadvantaged and advantaged ones. This is a way of assessing education as a tool for reducing inequalities once students have left the education system. The sample is the EU-28 countries using the European Union Statistics Income and Living Conditions database with its "Intergenerational transmission of disadvantages" module between 2005 and 2019. Results show that there is a glass ceiling for disadvantaged students because although some of them have overcome adversities and have been resilient, the most advantaged individuals tend to have higher hourly wages, indeed more than 5%. Therefore, education is an essential tool for making the "social elevator" work, but it has some limitations. These limitations are related to relational capital or educational information, more present in advantaged socioeconomic contexts.

Chapter five is centred on examining the impact of having a career guidance counsellor at school on motivation, expectations, and cognitive skills. By employing a quasi-experimental approach and using PISA 2018 data for the OECD sample, this chapter establishes a strong relationship between the provision of career guidance and better motivation and expectations about the future, but only for socioeconomically disadvantaged students. This heterogeneity is explained by the information inequality, as discussed in the previous chapter, where students from advantaged backgrounds already have access to the necessary information, while those from homes with a low educational level may lack this knowledge. Thus, if a career

guidance counsellor can provide this information to disadvantaged students, they are more likely to be motivated, which can positively impact their academic performance. In fact, the results from this chapter also demonstrate a significant effect only on academic performance for disadvantaged students, but why might a career guidance counsellor have a positive impact on mathematics, reading, and science performance? Mainly due to the improvement in expectations and intrinsic motivation. Moreover, differences between relatively rich and poor countries are also taken into account, following the procedure in chapter three.

Finally, chapter six presents the main conclusions of this Doctoral Thesis along with some final reflections.

Chapter 2

Methodology

This chapter outlines the methodology adopted to address the research questions raised in each chapter, in accordance with the Universitat de València's guidelines on the structure of a Doctoral Thesis. The following three chapters are self-contained from introduction to conclusions, each one with its own more extensive methodology section.

However, there is a methodology that is cross-cutting and structures the entire Doctoral Thesis, and this is the use of multilevel models. This approach is especially useful for the type of analysis carried out in the following three chapters, as it takes into account that some individuals belong to the same context, such as the same school or country. Therefore, these individuals share some characteristics and it is important to control for a possible correlation between them. It is true that the multilevel models applied in the following chapters are of great variety, and even combined with some quasi-experimental approaches, but essentially they all

group individuals into groups and these groups into levels. For example, students are grouped into schools, which could represent a second level, since level one is individuals, and level three could be the countries to which these schools belong.

The third chapter is focused on the definition and determinants of resilience using PISA waves from 2003 to 2018 for the OECD sample, as it was already mentioned. For a student to be classified as resilient, they must be first classified as socioeconomically disadvantaged. Following the literature (OECD, 2011), a student is socioeconomically disadvantaged if the index variable for measuring the socioeconomic background in PISA (ESCS) is below the 33rd percentile in their country (Agasisti et al., 2017). The second condition is to achieve higher educational performance than expected given the socioeconomic status level. To know that a multilevel regression is applied (Equation 2.1), one for each PISA wave and plausible value, with the ESCS index as the unique explanatory variable, letting this effect vary by country, i.e. it is not assumed that the effect of the socioeconomic status is the same for all countries (the main methodological contribution of this chapter).

$$PVMATH = \gamma_{00} + \beta_1 ESCS_{ij} + \epsilon_{ij} + \delta_{0j} \tag{2.1}$$

where $\beta_1 = \gamma_{10} + \delta_{1j}$, i =student and j=country

In Equation 2.1 $PVMATH$ represents the mathematics score of each student, and $ESCS_{ij}$ is the above-defined ESCS index variable. The same performance indicator (mathematics) is selected in every wave for the sake of consistency, but results are

robust with reading and science. Individual and cluster errors are summed ($\epsilon_{ij}+\delta_{0j}$), controlling for the varying effect of background in the different countries, and the 66th percentile of this sum is calculated. After selecting only the disadvantaged students, the resilient students are those found above this percentile, i.e. students who score way above expectation. Once resilients in each PISA wave are known, some simple estimations are done to compare the equality of opportunity, thanks to this percentage of resilient students, between the OECD countries along the time.

In order to examine deeper the factors that contribute to resilience and their implications for economic policy, multilevel probit models are used only for the disadvantaged sample. The dependent variable in these models is a dichotomous variable representing resilience, with a value of 1 indicating that the student is classified as resilient and 0 indicating otherwise.

$$P(y_{ijk} = 1|X_{ijk}, \delta_{0j}, u_{0jk}) = \phi(\gamma_{000} + \beta X_i + \beta' X_{ij} + \beta'' X_{ijk} + \delta_{0j} + u_{0jk}) \quad (2.2)$$

Equation 2.2 shows the proposed binary response model, where there are some fixed effects at all levels, X_{ijk}, and a series of random effects, δ_{0j} and u_{0jk}. In this equation, subindex i represents the student; j, the school; and k, the country.

Chapter four represents a further step to the previous chapter, and also to the rest of the resilience literature. The main objective of this fourth chapter is to analyse whether being resilient in education is useful for socioeconomically disadvantaged students during adult life in hourly wages. To do so, resilient students

are redefined, but in this case using the level of education attained, thanks to the EU-SILC database from 2005 to 2019 and the "Intergenerational transmission of disadvantages" modules where information on the socioeconomic status of origin and current wages of individuals can be found.

Once a socioeconomic status index is created using information about parents' education and occupation information (pseuo-ESCS) when individuals were 14 years old, to be resilient they need to achieve a higher educational level than expected, given their disadvantaged socioeconomic background. Thus, unlike previous studies that have used PISA scores, in this chapter multilevel ordered probit models are estimated. These models have just one explanatory variable: the socioeconomic background (X_{ij}) and where the dependent variable is the educational level achieved, which takes four values. Equation 2.3 shows the model considered, which is applied to the three waves of the module "Intergenerational transmission of disadvantages" (2005, 2011 y 2019). This equation represents the multilevel ordered probit in terms of latent response (y^*_{ij}). As can be seen from the equation, this is a multilevel model with a second-level random intercept (δ_{0j}) and random slope (δ_{ij}):

$$y^*_{ij} = \gamma_{01} X_{ij} + \delta_{0j} + \delta_{1j} X_{ij} + u_{ij} \tag{2.3}$$

Where i =individual and j =country

Given the estimated probabilities and the actual educational level attained, a percentage of surprise or disappointment is created ($[y_{ij} - \hat{y}_{ij}]/\hat{y}_{ij}$). Resilient indi-

viduals are those who, as well as coming from disadvantaged socioeconomic backgrounds,[1] are above percentile 66 of those who achieved a higher educational level than expected ($[y_{ij} - \hat{y}_{ij}]/\hat{y}_{ij} > 0$).

To assess wage differences between individuals according to their initial socioeconomic background, hybrid multilevel regressions with three levels are used (Equation 2.4). The first level is represented by individuals (i), the second by country-wave groups (j) (one group per country and wave) and the third by countries directly (k). This means that individuals are grouped according to their country and wave and these country-wave groups are grouped into countries. The dependent variable is the gross wage per hour worked (w_{ijk}) with a categorical variable that classify the sample according to the pseudo-ESCS as the main explanatory variable. There are four kind of individuals in that classification: disadvantaged, resilients, advantaged[2] and socioeconomically non-classified. There are also other explanatory variables, used as control ones, at the first level like for example education, occupation or activity sector (X_{ijk}). Moreover, other control variables, like GDP per capita or the Gini index, are used at higher levels (Z_{jk} and $\hat{Z}_k$). The second-level variables represent fluctuations in each wave from the country average ($Z_{jk} - \hat{Z}_k$) while the

[1]Disadvantaged individuals are those below percentile 33 of the variable measuring socioeconomic background (pseudo-ESCS) for their country of origin.

[2]Advantaged individuals are those above percentile 66 of the variable measuring socioeconomic background (pseudo-ESCS) for their country of origin.

third-level variables or k are the average for the period $\hat{Z}_k$ for each country.[3]

$$w_{ijk} = \beta_0 + \beta_1 X_{ijk} + \gamma_{within}(Z_{jk} - \hat{Z}_k) + \gamma_{between}\hat{Z}_k + \delta_k + \epsilon_{jk} + u_{ijk} \qquad (2.4)$$

Where i =individual, j =country-wave and k = country

The fifth chapter assesses the effect of a public and educational policy on the equality of opportunities inside the education system. This policy is the provision of a career guidance counsellor in school and the main objective of this chapter is to analyse the heterogeneous effect of this policy depending on the students' socioeconomic background. The mechanism expected is that the provision of information and support done by the counsellor could have a higher effect on students without that information and support at home, i.e. the disadvantaged ones. This provision of information and support could have a direct effect on students' expectations and intrinsic motivation. Then, more motivated students are expected to work more, and even better, what could affect positively their academic performance.

Bearing in mind that the database used is PISA 2018, the last wave available, one of the best techniques to analyse the impact of that policy is the Propensity Score Matching (PSM) procedure, especially useful for finding strong relationships with cross-sectional data. This method is known as quasi-experimental and aims to simulate a randomization process by matching students who have similar values of a propensity score based on observable characteristics, in order to try to identify

[3]Therefore, the variables finally used in the regression of the country level are the differences from the average in each wave of GDP per capita data and the Gini index in level two and the average for the period of these variables in level three.

a causal effect of a treatment. The goal is to match individuals who are similar in several observable variables, but differ in their treatment status, although this chapter does not claim for causal relationships.

There are three steps in this procedure. The first one is the creation of two groups, the treatment group and the control one, based on whether they have a career guidance counsellor employed at school or not (the treatment variable). In the second step, a logit model is estimated to obtain the linear propensity scores, as it can be seen in the left-hand side part of Equation 2.5. Once the scores are obtained, students are matched with a non-exact matching for most of the variables. However, students are matched only within countries, to compare treated and untreated students living in a similar context. Thus, an exact matching for the country of origin is done.

$$\log\left(\frac{p}{p-1}\right) = \beta_0 + \beta_1 X_{individual} + \beta_2 X_{school}, \tag{2.5}$$

where $X_{individual}$ represents all individuals covariates and X_{school} the school ones.

Students are matched using nearest neighbor method with replacement, matching the closest observations in terms of linear propensity scores between treated and untreated individuals. Groups are balanced on the observable variables, having two theoretically similar groups differing only for having (treatment group) or not having (control group) a career guidance counsellor employed at school.

The third step is to measure the effect of the treatment variable (CG_{jk}) with

the matched and balanced sample. In this case, a three-level model with random intercepts at both levels is used, as it can be seen in Equation 2.6.

$$Y_{ijk} = \beta_0 + \beta_1 CG_{jk} + \delta_k + \epsilon_{jk} + u_{ijk}, \tag{2.6}$$

where i=students, j=school and k=country.

Notice that the treatment is at school level. Thus, the unique explanatory variable in Equation 2.6 is a dummy indicating if there is a career guidance counsellor employed at school (CG_{jk}) and its estimated effect (β_1) that depends on which dependent variable we are using (Y_{ijk}). Nonetheless, the specific procedure used here tends to match similar individuals attending similar schools with the only difference of having (or not) a formal guidance counsellor employed at their schools.

Chapter 3

Resilience determinants in the heterogeneous OECD context

3.1 Introduction

Social mobility has been broadly studied from different points of view and disciplines, especially from an education economics perspective. This interest arises because of how vital it is for advanced societies to guarantee equality of opportunity given the high economic and social consequences at stake. There is clear consensus on the importance of education as a social elevator and the need for devising economic policies that increase equality of opportunity in the education of individuals. However, despite this consensus, there is relatively little research that analyses equality of opportunity or provides economic policy recommendations for fostering it. Thus,

A version of this chapter is published in Vicente et al. (2021).

there is a gap in the literature that our study aims to help fill. In contrast to other studies, our paper does not simply analyse equality of opportunity. It proposes policies, mainly economic ones, that aim to improve equality of opportunity, using, for the first time in this field of study, the concept of resilience defined via multi-level analysis econometric techniques that take into account the varying effect of the socioeconomic background of countries.

Education, as the prime mover of the "social elevator", is key (Ermisch & Francesconi, 2001b; OECD, 2018a) , especially for upward social mobility (OECD, 2018a), i.e. the rising of individuals to higher social standings than their parents. The premise underlying these studies is that education helps mitigate the negative effects of a student's socioeconomic background. It serves as an inclusive tool that fosters personal and academic development, especially across generations (relative social mobility), and helps lessen the differences in the futures of the most disadvantaged students as better academic performance brings with it a higher probability of future success (Allmendinger & Leibfried, 2003; Hout, 2012; Pastor et al., 2012).

In addition to being vital ethically, equal opportunity has major socioeconomic impacts. It is one of the goals adopted by the United Nationsin its Sustainable Development Goals programme, a principle of advanced societies (Akiba et al., 2007) and a central pillar of the United Nations Human Development Report. A society in which the socioeconomic background of parents determines that of their children implies not only inequality of opportunity but also inequality of income and occupation. All of which leads to a lack of personal satisfaction for anyone

coming from a disadvantaged background (OECD, 2018a). It is also detrimental to meritocracy. Furthermore, the lack of opportunities means human capital is underutilised (Handl, 1985; OECD, 2018a), with both business opportunities and personal talent being lost. This leads to lower potential economic growth (OECD, 2011, 2016). Likewise, the most educated societies become more tolerant (Borgonovi & Miyamoto, 2010; Bynner et al., 2002) and open to change and have higher levels of confidence, a greater awareness of equity and less serious problems arising from insecurity (Lochner & Moretti, 2004; Vorhaus et al., 2008). Democracy is also stronger in such societies, in which democratic participation is fostered (OECD, 2018a; Pastor et al., 2012).

Our study seeks to analyse equality of opportunity in education, detect its determinants and, based on these, propose economic policies for improving it in market economy countries with relatively strong public welfare systems, such as OECD countries. With these objectives in mind, we use the concept of resilience applied to education. A student is considered resilient if, despite their relatively disadvantaged socioeconomic background, they overcome adversity to achieve a relatively high level of academic performance. We consider an education system more equitable—i.e. that it guarantees a greater degree of equality of opportunity—the greater the proportion of resilient students it has, in accordance with the OECD (OECD, 2018b). With the aim of increasing the proportion of resilient students, this study explores the determinants of resilience and outlines primarily economic policies.

Resilience in education is not a new concept and has been used in previous studies (Agasisti & Longobardi, 2014, 2017; Agasisti et al., 2017; Borman & Overman, 2004; Cordero & Mateos-Romero, 2021; Gordon Rouse, 2001; OECD, 2011, 2018b; Vicente et al., 2021; Wills & Hofmeyr, 2019). In contrast, one aspect that differentiates our study is the use of a multilevel econometric technique to redefine resilience. This technique allows capturing the effect of socioeconomic background and how it varies from country to country. It also means we can control for correlations between students in the same country.

Regarding the determinants of resilience and economic policies, there is no doubt that public expenditure is a key tool for states to improve the services provided to the public, including education.The literature has studied in depth the effect that the amount of public expenditure has on the academic performance of students, while the effect expenditure has on equality of opportunity has received less attention (although the measures in each case are not necessarily mutually exclusive.[1] Likewise, a question arises about economic policies and their effect on equality of opportunity: should OECD countries implement the same expenditure policies regardless of wealth?

Public expenditure can be allocated in many ways, and variations in effectiveness must be analysed. The works that analyse the effects of expenditure on academic performance find that some policies are only relevant in more developed countries (OECD, 2013). Thus, it is important to investigate and verify if proposed policies

[1]Empirical evidence suggests that both objectives are compatible as countries scoring highly for either objective tend to also rank highly for the other (Pfeffer, 2012)

are valid for all countries regardless of standard of living or if different policies are required according to a country's level of development. This paper analyses these questions to provide economic policy measures that take into account standard of living aimed at boosting equality of opportunity for individuals in OECD countries. With this objective in mind, we use multilevel probit models that consider the characteristics of students, including soft skills, and their schools, controlling for the differences found in the OECD with resilience as the dependent variable. To obtain results adjusted for the standard of living of countries, the OECD countries are broken into two groups according to income per capita. Using these results, we perform simulations to model potential gains in equality of opportunity in countries if the proposed recommendations were followed and to identify the limits of such gains.

By using multilevel models, we are also able to study the differences between individuals and schools controlling for different levels of development and the varying criteria followed by the expenditure policies of different countries. Thus, our study also examines possible heterogeneities between the two groups of countries at more microeconomic levels (individuals and schools), where soft skills may be of special importance for resilience (García-Crespo et al., 2021; Sandoval-Hernández & Białowolski, 2016).

Our study uses the PISA database because, in addition to data on comparable academic performance, it contains information that allows controlling for numerous individual and school characteristics. The database provides highly standardised

data, with information on the socioeconomic background of families in each wave. Thanks to the long-term nature of PISA, the data can be used to determine the proportion or percentage of resilient students by country and year for an extensive time period (2003–2018).

This paper is structured as follows. Following this introduction, Section 2 reviews the literature, Section 3 explains the methodology, Section 4 describes the results and Section 5 outlines economic policy recommendations that can be derived from the results. Lastly, Section 6 contains the conclusions.

3.2 Literature review

The continued presence of the PISA results in the media, political discourse and scientific articles has inspired education systems to pursue excellence. However, excellence (in academic performance) cannot be the sole objective. An education system should also consider other aspects such as access to education and the barriers that some students must overcome to excel academically. In other words, education systems must seek the twin goals of excellence and equality of opportunity, referred to by Pfeffer (2012) as "quality" and "equality", with equality referring more to how different it is for students from different socioeconomic backgrounds to reach the same educational performance.

However, there are two types of educational inequality. One has to do with access; the other with outcomes. The first source of inequality has been overcome in

developed nations such as OECD countries.[2] The second has to do with the effect that the socioeconomic background of students (i.e. the parents' level education, wealth, etc.) has on academic performance. If a significant and positive relationship is found between socioeconomic background and academic performance, the education system is falling short of one of its main objectives: to be the prime mover of the social elevator.

The popularity in education economics of the effects of socioeconomic background in education began with Coleman et al.'s (1966) pioneer paper, which finds that students in the US with similar backgrounds tend to achieve similar academic performance. Therefore, an individual's background is more important than school characteristics, which are secondary (Hanushek & Woessmann, 2011), although the strengths and weaknesses of schools more directly affect students from relatively worse backgrounds (Coleman et al., 1966). Fifty years after Coleman's research, with more refined econometric techniques and richer databases available, studies find that schools do play a key role in mitigating the socioeconomic differences in cognitive abilities (Downey & Condron, 2016).

Although some debate persists on the role of schools in reducing the differences, the literature appears to have demonstrated that certain policies can favour equal opportunity. In any case, comparatively little research has been done on what policies reduce inequality in education (Agasisti & Longobardi, 2017; Agasisti et al., 2017; Schlicht et al., 2010) compared to studies on academic performance or

[2]Most young people in OECD countries can and must attend school. On average, 90% of the population between 4 and 17 years was enrolled in school in 2016 (OECD, 2018b)

excellence.

Among educational policies, expenditure policies have captured widespread interest. With regard to equality of opportunity, Schlicht et al. (2010) find that in the EU public expenditure is irrelevant for mitigating the effect of socioeconomic background past the threshold of spending $ 11,000 per student in a school year. Thus, this work demonstrates that while resources and investment are determinants for equality of opportunity, they must not always be the first nor the only option.

Related to this, there are works that use a methodology similar to ours, i.e. using resilient students, to measure the effects that public expenditure has on the education system. For instance Agasisti et al. (2017), using a sample of OECD countries and data per country, finds that the effect of public expenditure differs depending on the income per capita of the country and, therefore, the total sum invested in education and the standard of living of the inhabitants.[3]

Another key economic policy studied in the literature also examined in this paper is that of teacher salary, although it has clearly been researched less than public expenditure, especially with regard to equality of opportunity. However, it seems that the link between teacher salary and teacher quality is positive and strong (Dolton & Marcenaro-Gutierrez, 2014). Salary and working conditions are important for motivation and teaching quality, both of which could directly affect student per-

[3](Agasisti & Cordero-Ferrera, 2013), which compares similar countries (Spain and Italy) with different needs, illustrates a clear example of the need to take into account the differences between countries when making public policy recommendations. Other works ("Effects of political rivalry on public investments in education and income inequality", 2016) also find that the effect of public policies varies based on the development of the country.

formance (Dolton & Marcenaro-Gutierrez, 2014). However, as with total education expenditure, the effect of teacher salary on academic performance can vary depending on where and how it is invested. It has been shown that, for a sample of OECD countries, teacher salary is relevant for explaining academic performance in PISA only for countries with the highest per capita income (OECD, 2013). From this, we can extrapolate that once the primary needs for physical capital resources have been met, what needsto be improved isthe human capital (OECD, 2013) . However, no works exist in the literature, to the knowledge of the authors, that study the effect of teacher salary on equality of opportunity.

3.3 Methods

The main methodology used in this study is based on multilevel regressions or hierarchical lineal models capable of fully harnessing the informational wealth of the PISA data, with the recommendations of the OECD being followed (OECD, 2009, 2017). In contrast to the techniques used in other studies, these multilevel techniques are able to take into account any possible correlation between students from the same school and country. This is because students in the same school have access to the same physical and human resources. A similar effect occurs with students from the same country. Thus, as PISA provides school and country data, this type of regression is the most appropriate as it can be used to exploit the wealth of information available.

We use the percentage of resilient students (of all disadvantaged students) as the proxy variable for the degree of equal opportunity in an education system. A student is considered resilient if, despite coming from a disadvantaged background, they obtain good academic results. Therefore, this indicator measures how education contributes to boosting upward social mobility in the country in question.

For a student to be classified as resilient, they first must be classified as socioeconomically disadvantaged. In our study, like in OECD (2011), we consider a student socioeconomically disadvantaged if the variable for measuring socioeconomic background in PISA (ESCS) is below the 33rd percentile for their country (Agasisti et al., 2017). [4] Second, they must achieve sufficiently high results in PISA. For the OECD, this means scoring in the last quartile (OECD, 2018b) or above the 66th percentile (OECD, 2011), although in these cases the differing social and economic circumstances are not taken into account for those classified as disadvantaged students. Thus, in our study, we make an estimate taking into account the background of each student, letting this effect vary by country. In other words, we use a multilevel regression for each year and plausible value, with countries being on the second level, as can be seen in Equation 3.1: [5]

[4]The ESCS variable takes into account the parents' wealth, education and work. It is an index based on a weighted probability estimate. It has an average of 0 and a standard deviation of 1 for the entire OECD. See OECD (2011) for more information.

[5]To make this estimate, the weights are rescaled following the recommendations of a number of multilevel regression experts (Carle, 2009). In this case, the procedure used is the effective summing of the cluster size (Carle, 2009; Rabe-Hesketh & Skrondal, 2006), although how the weights should be rescaled is still debated.

$$PVMATH = \gamma_{00} + \beta_1 X_{ij} + \epsilon_{ij} + \delta_{0j} \tag{3.1}$$

where $\beta_1 = \gamma_{10} + \delta_{1j}$, i =student and j=country

Where PVMATH is the maths score of each student, and X_{ij} is the above-defined ESCS variable. After estimating Equation 3.1 for the entire sample, we obtained two error types, individual (ϵ_{ij}) and cluster (δ_{0j} and δ_{1j}) errors, where δ_{0j} is the random part of the intercept, and δ_{1j} is the random part of the slope. These errors include all differences that cannot be explained after controlling for the background of an individual for the maths score. As using the average of the ten plausible values would give rise to biases and because in OECD (2009) using only one plausible value does not lead to this problem, all plausible values are used, with five or ten equations for each wave, depending on how many plausible values each wave has. [6] The same performance indicator (maths) is selected in every wave for the sake of consistency. Furthermore, the maths score is understood to be the easiest skill to compare in students of different origins as it is a universal language and a subject with clear spillover effects to other subjects (Denny & Oppedisano, 2013). Moreover, and although previous studies with similar aims use the same performance indicator in PISA (Ferraro & Põder, 2018), we perform robustness tests on reading and sciences, with the main results being maintained.

Therefore, the procedure followed in our study is based on estimating Equation 3.1 for the entire sample and all years. Individual and cluster errors are summed

[6] A student is considered resilient if they are in more than a half of the plausible values.

$(\epsilon_{ij} + \delta_{0j})$, controlling for the varying effect of background in the different countries, and the 66th percentile of this sum is calculated. After selecting only the disadvantaged students, the resilient students are those found above this percentile, i.e. students who score way above expectation, overcoming adversity given their background and the effect of it in their country.

To study the determinants of resilience and the economic policy implications, we use multilevel probit models including variables at three levels (student, school and country) for the disadvantaged sample, where the dependent variable is the dichotomous variable of resilience, taking a value of 1 if the student is classified as resilient and 0 otherwise.

$$P(y_{ijk} = 1|X_{ijk}, \delta_{0j}, u_{0jk}) = \phi(\gamma_{000} + \beta X_i + \beta' X_{ij} + \beta'' X_{ijk} + \delta_{0j} + u_{0jk}) \quad (3.2)$$

Equation 3.2 shows the proposed binary response model, which follows the cumulative normal distribution function given a set of fixed effects at all levels, X_{ijk}, and a series of random effects, δ_{0j} and u_{0jk}. In this equation, subindex i represents the student; j, the school; and k, the country.[7]

[7]The weights were used following the same methodology as in Equation 3.2 (Carle, 2009).

3.4 Results and discussion

3.4.1 Resilience and the public expenditure in education

The relationship between public expenditure and equality of opportunity is not always as clear as might be expected. A priori, education systems with greater resources have it easier to better teach students, but the countries that spend the most are not always those that obtain the best results (OECD, 2012). In fact, some studies indicate that what matters most is how the money is spent; not how much there is (OECD, 2012) . Thus, to increase equality of opportunity in education, it appears necessary to devise economic policies differentiated according to the standard of living of countries.

Analysing economic policies through a differential treatment of countries is nothing new. Indeed, many studies show that the effect of public investment on academic performance depends not only on the amount invested but also on the standard of living of the country where the expenditure is made and how it is made (OECD, 2012, 2013). Thus, like in Agasisti et al. (2017) and OECD (2012, 2013), with a sample similar to in this paper, we distinguish between two groups of countries: relatively poor and relatively rich countries.

To take into account the possible divergence between countries, we use the 33rd percentile as the threshold for this classification, using the average GDP per capita for the period selected, [8] with the remaining countries being considered relatively

[8]Countries below this threshold: Chile, Czech Republic, Estonia, Greece, Hungary, Lithuania, Latvia, Mexico, Poland, Portugal, Slovakia, Turkey and Colombia.

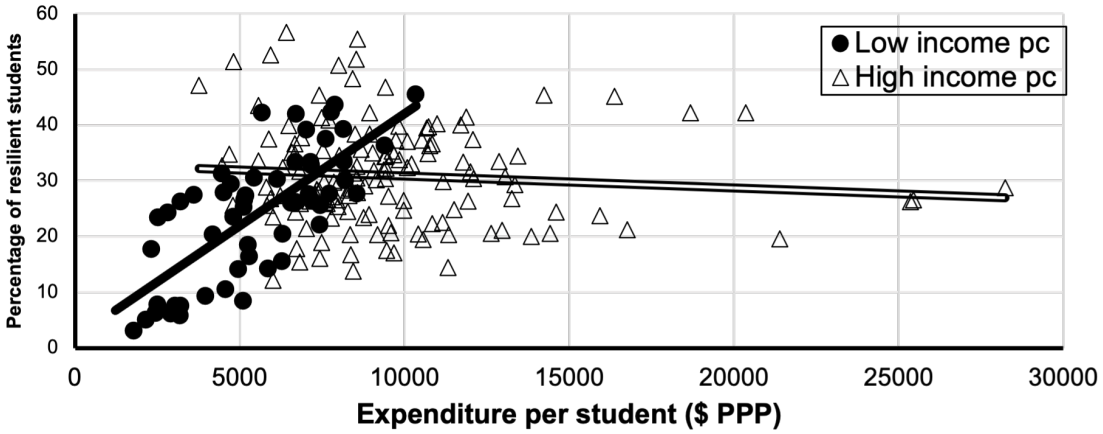
rich. After making this division, we study the effect of public expenditure during the period examined (2003–2018) on the percentage of resilient students.[9] Figure 3.1 shows that the effect of public expenditure in the poorer countries is significant, i.e. the poorer countries that spend the most tend to have a greater percentage of resilient students in contrast to the countries with higher income per capita. This greater effect of expenditure in the poorer countries may explain the convergence over the period studied in terms of resilient students; while at the turn of the century countries with lower incomes per capita spent 2.4 times less than the other countries in terms of expenditure per student, this difference fell to 1.6 in 2018.[10]

The lack of a statistically significant relationship between expenditure and equal opportunity in countries with higher income per capita seems to indicate that above a certain expenditure threshold how resources are spent is far more important than the quantity of them for improving outcomes and equality of opportunity (OECD, 2013). The results suggest that countries with lower income per capita do suffer from a lack of resources that constitute an obstacle to boosting academic performance and equal opportunity. We look at this last point and economic policy recommendations, considering these two groups of countries, further on.

[9]This effect is verified via a panel data model with fixed effects. This effect is similar to using the 25th and the 50th percentiles for classifying relatively poor and rich countries

[10]Model and data available on request to the authors.

Figure 3.1: Relationship between public expenditure on education and the percentage of resilient students by income per capita. 2003–2018.



Source: OECD (PISA, OECD.Stat) and own elaboration.

3.4.2 Resilience determinants

To be able to make recommendations on education and economic policy, we explore what factors determine this resilience, taking into account individual characteristics and focusing on the use of public resources. To do this, we use two multilevel probit models for the sample of disadvantaged students, differentiating between the two above-mentioned subgroups of countries. In these models, the dependent variable is assigned the value 1 if the socioeconomically disadvantaged student is resilient and 0 otherwise. Table 3.1 shows the variables in three levels (individual, school and country) and differentiates between the sample of disadvantaged students and the sample of advantaged students for the sake of comparison.[11]

In comparing disadvantaged and advantaged students for the ESCS variable, of note is the GRADE variable, which measures the difference from the modal grade for

[11]Advantaged students are above the 66th percentile in their country for the variable that measures background (ESCS).

a 15 years old student. Thus, we can see in the table that disadvantaged students are, on average, further below this modal grade. The same table also shows that there is a higher proportion of immigrants among disadvantaged students than advantaged ones, both first-generation (IMMIG1) and second-generation immigrants (IMMIG2). The same occurs with the percentage of students that speak a language different to the test language at home (LANGUAGE).

The model includes various variables related to soft skills (Heckman, 2011; Heckman & Kautz, 2012), which went, in order, from motivation to work (MOV) to competition tolerance (COMPE). For all these variables, students from higher socioeconomic backgrounds score higher. This suggests that in an environment in which the parents are more educated and probably more concerned for the education of their children and where there is no lack of resources, students usually have higher motivation (MOV), more and better future expectations (EXPEC), greater self-confidence (SELF), and a better tolerance to competition (COMPE). Despite the importance of these variables, given that neither excellence nor resilience depend exclusively on the resources available, they are rarely examined. These variables may be what mark the big difference between the two subsamples of students, the comparison of which shows how having sufficiently educated parents can affect academic performance with the cascading consequences.

Regarding school and country levels, the first notable result is that, as expected, a greater proportion of students in the disadvantaged group attend public schools (88%) than students in the advantaged subsample (73%). At first glance, this would

Table 3.1: Descriptive statistics. Student, school and country level, according to ESCS socio-economic background.

		Low income per capita			High income per capita		
Individual level variables:	Variable	Average	Min.	Max.	Average	Min.	Max.
Sex (reference: male)	SEX	0.5	0	1	0.5	0	1.1
Grade (modal grade difference)	GRADE	-0.2	-3	3	-0.02	-3	3
Age (years)	AGE	15.79	15.2	16.3	15.79	15.1	16.3
First-gen immigrants	INMIG1	0.08	0	1	0.05	0	1
Second-gen immigrants	INMIG2	0.11	0	1	0.06	0	1
Language (reference: test language)	LANGUAGE	0.17	0	1	0.1	0	1
Motivation to work (index)	MOV	-0.08	-2.7	1.8	0.13	-2.7	1.8
Reading enjoyment (index)	ENJOY	-0.21	-2.7	2.7	0.17	-2.7	2.7
Career expectation (ISEI)	EXPEC	59.15	11	89	70.48	11	89
Self-confidence (index)	SELF	-0.2	-2.4	1.9	0.21	-2.4	1.9
Tolerance to competition (index)	COMPE	-0.08	-2.3	2	0.11	-2.3	2
Disciplined environment (index)	ENVI	-0.04	-2.7	2	0.09	-2.7	2
School level variables:							
Subsidised school (equal to 1)	SUBSCH	0.1	0	1.1	0.14	0	1
Private school (equal to 1)	PRISCH	0.02	0	1.1	0.12	0	1
Lack of respect for teachers	RESPE	2.15	1	4	1.94	1	4
Properly trained teachers	TRAINED	0.82	0	1	0.83	0	1
Class size ¿ 35 students	SIZECL	0.11	0	1	0.13	0	1
ESCS average	ESCSA	-1.09	-4.1	0.3	0.97	-0.7	3.4
Grouping classes by ability	GROUP	0.45	0	1	0.46	0	1
Country level variables:							
Teacher starting salary/GDP p.c.	SALGDPpc	0.82	0.4	2.5	0.82	0.4	2.5
Public expenditure/student ($PPP)	EXPstu	10.02	2.4	28.2	10.02	2.4	28.2
Number of observations (student/school/country)		92,576/10,657/37			98,302/10,333/37		

Source: OECD (PISA, OECD.Stat), UNESCO, United States Census Bureau and own elaboration.

appear to be because students from wealthy backgrounds have greater decision-making capacity as they can choose whether they attend a public school. For the country variables, because in all countries the proportion of advantaged versus disadvantaged students is the same, there are no notable differences.

Table 3.2 contains the descriptive statistics and follows the same methodology but differentiates instead only for disadvantaged students in the above-mentioned country groupings. The main difference is the greater proportion of immigrants and students speaking a different language in the sample of wealthier countries, explained by there being a greater proportion of immigrants in these countries owing to them being net importers of population.

In this case, there are differences for the country variables in contrast to above. What immediately jumps out is the higher starting salaries of teachers, with respect to GDP per capita, in the relatively poorer countries. This suggests a higher appraisal of teachers in these countries in which these professionals are relatively better off than their counterparts in the wealthier countries. However, expenditure per student, corrected by purchasing power parity in dollars, is higher in the relatively wealthy countries.

Table 3.3 shows the final model, with its marginal effects, for the two country groups. The general trend hardly varies in both cases, especially for the first levels, although there are some interesting differences worth noting. First, being female is negative for resilience. Thisis probably due to the performance of females in maths(OECD, 2015). Furthermore, being a first-generation or a second-generation

Table 3.2: Descriptive statistics. Student, school and country level by income per capita in percentiles. Disadvantaged students.

		Low income per capita			High income per capita		
Individual level variables:	Variable	Average	Min.	Max.	Average	Min.	Max.
Sex (reference: male)	SEX	0.51	0	1	0.5	0	1
Grade (modal grade difference)	GRADE	-0.24	-3	2	-0.18	-3	3
Age (years)	AGE	15.79	15.3	16.3	15.79	15.2	16.3
First-gen immigrants	INMIG1	0.02	0	1	0.11	0	1
Second-gen immigrants	INMIG2	0.03	0	1	0.15	0	1
Language (reference: test language)	LANGUAGE	0.07	0	1	0.22	0	1
Motivation to work (index)	MOV	-0.06	-2.7	1.8	-0.09	-2.7	1.8
Reading enjoyment (index)	ENJOY	0.01	-2.7	2.7	-0.3	-2.7	2.7
Career expectation (ISEI)	EXPEC	59.43	11	89	59	11	89
Self-confidence (index)	SELF	-0.27	-2.4	1.9	-0.16	-2.4	1.9
Tolerance to competition (index)	COMPE	-0.05	-2.3	2	-0.09	-2.3	2
Disciplined environment (index)	ENVI	-0.03	-2.7	2	-0.05	-2.7	2
School level variables:							
Subsidised school (equal to 1)	SUBSCH	0.07	0	1	0.12	0	1.1
Private school (equal to 1)	PRISCH	0.01	0	1	0.02	0	1.1
Lack of respect for teachers	RESPE	2.1	1	4	2.19	1	4
Properly trained teachers	TRAINED	0.73	0	1	0.86	0	1
Class size ¿ 35 students	SIZECL	0.2	0	1	0.05	0	1
ESCS average	ESCSA	-1.53	-4.1	-0.4	-0.89	-3.3	0.28
Grouping classes by ability	GROUP	0.28	0	1	0.53	0	1
Country level variables:							
Teacher starting salary/GDP p.c	SALGDPpc	0.87	0.5	2.5	0.8	0.4	1.3
Public expenditure/student ($PPP)	EXPstu	6.79	2.4	10.3	11.38	7.4	28.2
Number of observations (student/school/country)		24,894/3,254/13			67,582/7,403/24		

Source: OECD (PISA, OECD.Stat), UNESCO, United States Census Bureau and own elaboration.

immigrant is worse in relatively poor countries. This might be owing to how each education system handles immigrants and how much resources are allocated for this purpose. It may also have to do with the type of immigration. We also find that soft-skill variables appear to be less important in countries with lower incomes per capita as not all these variables are significant and those that are do not demonstrate a clear trend. This could be explained by a greater lack of resources, i.e. tangible factors.

In any case, the result confirms that soft skills play an important role in educational resilience (García-Crespo et al., 2021; Sandoval-Hernández & Białowolski, 2016) and thus should be given more prominence in education. However, soft skills can be more easily addressed in the earlier stages of education during which attention can be paid not only to disadvantaged students but to their families and environments (Heckman, 2011), which must be supported from preschool so they can help the children develop skills that will be decisive for their futures (Agasisti & Cordero-Ferrera, 2013).

With regard to the school level variables, mutual respect (RESPE) and background are vital (ESCSA).This implies that relationships play an important role in individual performance (OECD, 2015) for the sample of disadvantaged students; it is not just about resources or individual variables. The socioeconomic background of class and schoolmates also matters—the so-called peer effect (Robertson & Symons, 2003).

The above-mentioned lack of resources is reflected in the expenditure per student

variable (EXPstu) being significant only in the relatively poor countries. This, along with what was demonstrated in previous sections, shows that the lack of resources in these countries negatively affects the equality of opportunity of students. In fact, given that, as is described later on, the relationship is non-linear, on average, an increase in $1000 causes a rise of more than 5% in the probability of resilience in these countries. This, in turn, may explain the less weight that the more intangible variables, such as soft skills, has in the probability of being resilient as the other more tangible limitations crop up first.

The starting salary over GDP per capita (SALGDPpc) variable highlights the need to increase teaching salaries in the wealthier countries. This is because, for this country group, students from nations where teachers have a better standard of living have a greater probability of overcoming the adversity of their background. Given the statistical significance of the country variables and the differences between the two country groups,[12] we perform a series of simulations to analyse the effect of an increase in public expenditure per student on the predicted average probability of resilience in the relatively poor and wealthy countries. We do the same for teacher salary.[13] The results are shown in Figures 3.2-3.5, which demonstrate how public expenditure clearly impacts the probability of being resilient in the first country group but not in the second group, where the confidence interval is clearly broader,

[12]Robustness testing was performed using science and reading as the variables for determining academic performance, with the main results being maintained. Models available on request to the authors

[13]The simulations are calculated assigning the rest of the variables their averages, leaving them constant at this value (all other things being equal), and changing only the variable of the x-axis.

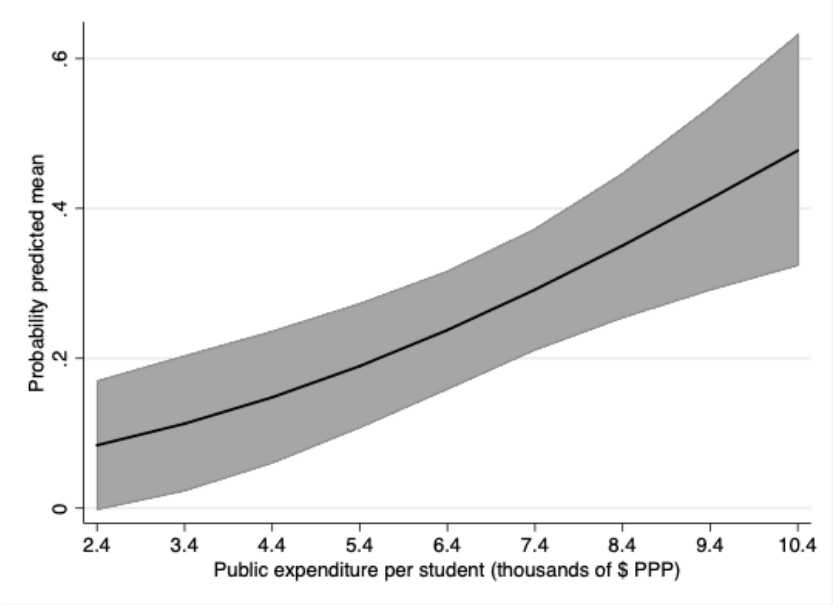
Table 3.3: Marginal effects. Multilevel probit estimation. Resilience determinants by income per capita

Dependent variable: Resilience = 1						
	Low income pc.			High income pc.		
	ME		SE	ME		SE
Individual level variables						
SEX	-0.108	***	0.007	-0.111	***	0.016
EDAD	-0.013		0.033	-0.019		0.018
GRADE	0.129	***	0.022	0.196	***	0.026
INMIG1	-0.098	**	0.045	-0.034	**	0.017
INMIG2	-0.052	***	0.015	-0.036	*	0.015
LANGUAGE	0.015		0.017	-0.018		0.017
ENVI	0.022	***	0.004	0.018	***	0.003
MOV	-0.004		0.01	0.009	*	0.005
ENJOY	0.013	***	0.005	0.028	***	0.007
EXPEC	0.004	***	0	0.003	***	0
SELF	0.046	***	0.006	0.042	***	0.004
COMPE	0.007		0.004	0.013	**	0.005
School level variables						
SUBSCH	0.009		0.032	-0.014		0.02
PRISCH	-0.044		0.046	-0.056		0.049
RESPE	-0.03	***	0.008	-0.052	***	0.014
TRAINED	0.017		0.016	0.022		0.025
SIZECL	-0.02		0.024	0.009		0.027
ESCSA	0.09	***	0.026	0.091	**	0.039
GROUP	0.006		0.014	-0.011		0.01
Country level variables						
SALGDPpc	0.057		0.077	0.213	*	0.114
EXPstu	0.051	***	0.015	0.003		0.003
Observations and coefficient of determination:						
N. obs	12,142			25,576		
Log ps.like.	-4,144.70			-7,063.13		

Source: OECD (PISA, OECD.Stat), UNESCO, United States Census Bureau and own elaboration.
Note: The school size variable is in natural logarithm for reasons of scale. *** denotes significance to 1%; **, to 5% and*, to 10%.

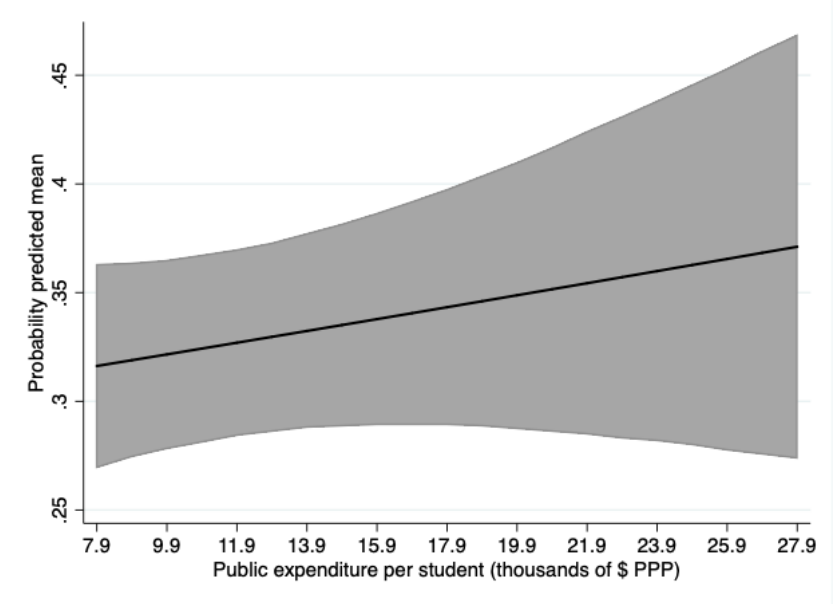
and the slope is much flatter. The opposite occurs when the main variable is salary.

Figure 3.2: Expenditure effect. Low income pc.



Source: OECD (PISA, OECD.Stat), UNESCO, United States Census Bureau and own elaboration.

Figure 3.3: Expenditure effect. High income pc.

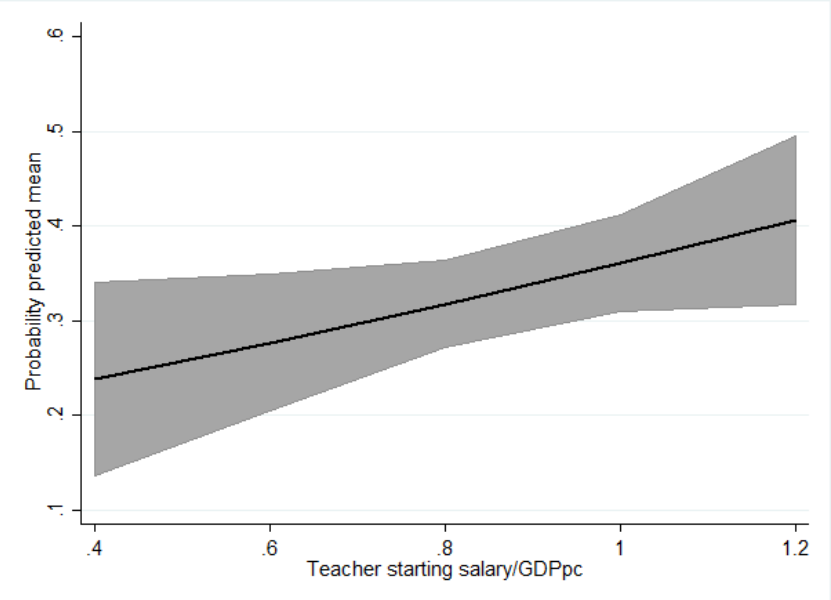


Source: OECD (PISA, OECD.Stat), UNESCO, United States Census Bureau and own elaboration.

Figure 3.4: Salary effect. Low income pc.

Source: OECD (PISA, OECD.Stat), UNESCO, United States Census Bureau and own elaboration.

Figure 3.5: Salary effect. High income pc.



Source: OECD (PISA, OECD.Stat), UNESCO, United States Census Bureau and own elaboration.

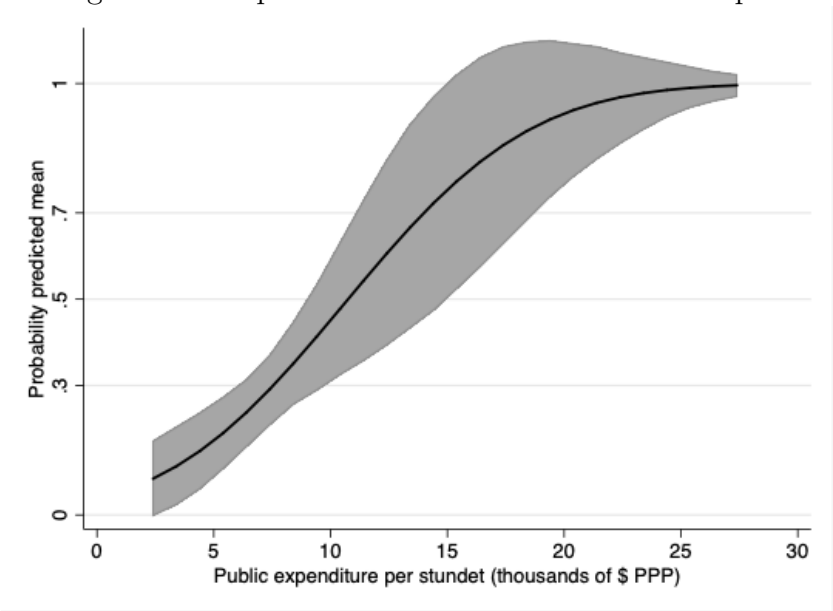
3.5 Economic policy recommendations

The above results are clearly useful for drafting economic policy guidelines and recommendations aimed at improving equality of opportunity in education in OECD countries. Thanks to the virtues of the multilevel model and making full use of the information available, recommendations can be made controlling for individual characteristics and the schools of individuals in the different countries.

Looking at country macroeconomic variables, our results suggest that more investment is needed in countries with lower incomes per capita. However, additional investment must be efficient, keeping in mind that more expenditure does not necessarily lead to greater equality of opportunity. Furthermore, as can be seen in Figure 3.6, the results suggest that there is an expenditure threshold of around $11,400 PPP, above which investment in education becomes less effective in terms of equality of opportunity, where the point of decreasing returns to scale appears.

For countries with relatively high income, the results suggest that the average starting salary of teachers should be increased to boost equality of opportunity. This is even more clear when comparing with the other group of countries. Thus, in countries in the higher income group in which teacher salary is higher in terms of GDP per capita, we find that students have a greater probability of being resilient. This means that, especially above a minimum threshold of resources, how money is spent trumps the amount of it. This is noteworthy because in previous publications (OECD, 2013), academic performance, i.e. education excellence, was taken into ac-

Figure 3.6: Expenditure simulation. Low income pc.



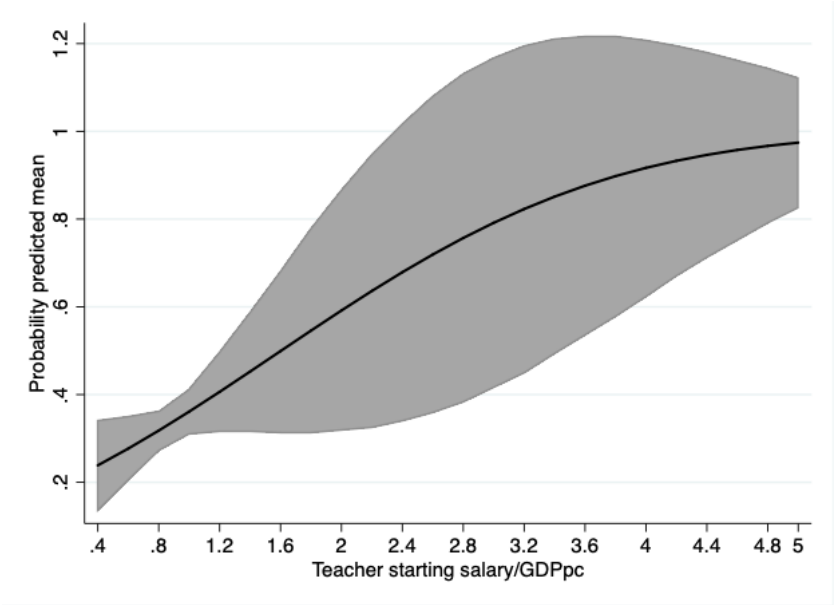
Source: OECD (PISA, OECD.Stat), UNESCO, United States Census Bureau and own elaboration.

count to make this point. Following this line of argument, higher teacher salaries make the teaching profession more attractive to better prepared candidates and, furthermore, are an indicator of the value that society places on teaching (OECD, 2013). However, as with public expenditure per student, returns diminish on increasing salary with respect to GDP per capita above a certain threshold, which we found to be when the starting salary over average income for the country is 1.6 (Figure 3.7). Above this point, policymakers could consider not only directly increasing teacher salary but also creating clear incentives, not necessarily financial, to have a greater effect on teacher motivation, beyond demonstrating a higher appraisal, both socially and economically, of the work of teachers.

To sum up, countries with lower incomes per capita need more physical, human

and financial resources in the form of things like teaching, scholarships and transport. However, the relatively wealthy countries have already passed a threshold above which increasing such resources does not mean, on average, more equality of opportunity. Wealthy countries should concentrate their economic policies on valuing teachers more highly and spending more efficiently

Figure 3.7: Salary simulation. High income pc.



Source: OECD (PISA, OECD.Stat), UNESCO, United States Census Bureau and own elaboration.

3.6 Conclusions

The main aim of this study is to analyse equality of opportunity and its determinants in OECD countries to be able to make economic policy recommendations on the allocation of public resources. Equality of opportunity in the OECD has rarely been touched upon in the literature, even less so with the aim of providing measures on

how to improve it.

Using the anonymised microdata from the PISA waves and multilevel regressions, our study begins by defining socioeconomically disadvantaged students who overcame adversity and obtained a higher-than-expected score in mathematics. These students are defined as resilient and are used as the proxy variable for equality of opportunity. The higher the percentage of resilient students, the better the education system works as a social elevator as there is greater independence between socioeconomic background and academic outcome. Using this percentage of resilient students, we find differences in OECD countries in the effect public expenditure has on this percentage, revealing two differentiated country groups according to per capita income. This indicates the need for differential treatment when recommending economic policy measures.

In this context of two groups in the OECD sample as a function of standard of living, an initial analysis of the determinants of resilience is done via multilevel probit models based on the structure of the PISA studies. Both samples show that soft skills play a major role in resilience and, therefore, in equality of opportunity, although developing these skills in students must be tackled at the earliest stages in the education system.

By differentiating between students in countries with lower versus higher GDP per capita, we can provide more effective and nuanced economic policy recommendations. Thus, we recommend increasing teacher starting salary with respect to GDP per capita in the wealthier countries and increasing public expenditure per

student in the poorer countries.

The need for a higher starting salary for teachers in the wealthier countries could be expected given the lower relative purchasing power of these teachers compared to teachers in the other group, i.e. the poorer countries. Therefore, there is a manifest need to put a higher value on thework of teachers, both financially and socially, without forgetting the need to create incentives,not necessarily financial ones, to boost the motivation of teachers and, in turn, their performance,especially in terms of equality in education.

With regard to public expenditure per student—the other major difference between the twosubgroups of countries—our analysis of the determinants of resilience supports the hypothesisthat countries with a lower GDP suffer from a lack of investment that leads to differences betweenthese poorer countries, in which on average equality of opportunity is greater the higher theexpenditure per student. However, we do not find this to be the case in the wealthier group ofcountries. For these countries, what matters most is how the money is spent. Therefore, economicpolicies must not be devised in the same way across the board for all OECD countries. Countrieswith fewer resources clearly need to continue increasing spending on education while wealthiercountries should focus more on how resources are spent, i.e. analyse where the resources shouldgo, thus seeking efficiency.

Chapter 4

Educational resilience during adulthood: a wage comparison

4.1 Introduction

The term resilience refers to the resistance or capacity to overcome adversities in difficult contexts or situations. This virtue can be attributed to countries, companies and students, among others. In economics of education resilient students are considered as those who, given their family backgrounds and disadvantaged socioeconomic origins, manage to overcome adversities and achieve a higher level of education than would otherwise have been expected in their socioeconomic circumstances. From a social point of view, the goal would be to achieve a high percentage of resilient students, as this reflects that its education system ensures more equality

A version of this paper has already been submitted to a journal.

of opportunities for students, its inclusiveness and its proper performance.

The concept of resilience in education has been defined previously in the literature (Agasisti & Longobardi, 2014, 2017; Agasisti et al., 2017; Borman & Overman, 2004; Cordero & Mateos-Romero, 2021; Gordon Rouse, 2001; OECD, 2011, 2018b; Vicente et al., 2021; Wills & Hofmeyr, 2019) and has been used to analyse equality of opportunities in the educational context, frequently based on the PISA survey (Programme for International Student Assessment) conducted by the OECD. Basically students were classified as resilient if, given their relatively disadvantaged socioeconomic background, they have obtained better educational performance than expected. Thus, the present study provides an extension of this literature, but for the first time, during adulthood. Then, we provide a pioneering analysis about how would be the future, in terms of hourly wages, of those students who were resilient inside the education system, comparing them with the non-resilient ones.

Numerous studies have shown that good educational achievement increases the probability of future economic success (Allmendinger & Leibfried, 2003; Bloom et al., 2007; Hout, 2012; Pastor et al., 2012). However, although educational resilience implies relative educational success, the literature has not analysed whether being educational resilient brings advantages in their adult life and, consequently, contributes to eliminate, totally or partially, their economic disadvantages (i.e. lower wages) with respect to individuals with advantaged socioeconomic backgrounds. This is especially relevant because if being resilient cannot, at least, reduce wage differences with the most advantaged individuals, education could not be a useful

tool to reduce inequalities in our societies.

Therefore, the main hypothesis (Hypothesis 1) tested in this study is that resilient individuals, because of their efforts to overcome adversities related to their initial socioeconomic background seen in a series of soft skills, achieve similar wage levels as those who start from an advantaged socioeconomic background, despite the fewer difficulties this latter group face. In other words, does being resilient in the educational stage mean that the possible economic differences between the advantaged and the disadvantaged in terms of wages are overcome in adulthood, and with them, differences in living conditions? Does simply coming from a disadvantaged background have a negative effect, despite having become resilient?

This is an important question for the education system and social mobility, since if, despite the public and private effort involved in being resilient, the differences in living conditions between socioeconomic disadvantaged and advantaged are not reduced or eliminated, education is deficient in its task of driving the upward social elevator. The answer to this question is hugely important, not only to validate the role of education as a social elevator that guarantees equality of opportunities for all individuals, but also to guide public policies.

Our second hypothesis (Hypothesis 2) tests whether the expected positive wage difference favouring resilient individuals over disadvantaged but non-resilient individuals can be explained exclusively by achieved educational level, and not by other unobservable variables related to resilience. Given their similar socioeconomic backgrounds, the resilient individuals have successfully overcome their adversities during

their years in education by demonstrating abilities related to soft skills that those who do not become resilient do not display. By definition, the resilient individuals have a better education, which suggests they should enjoy higher wages, but are there any differences, other than education, between these two types of individuals that can be explained by resilience? Are these unobservable features, that make some disadvantaged individuals resilient, relevant to explain the wage differences between resilient and non-resilient disadvantaged individuals?

In summary, the two hypothesis to be tested are as follows:

- Hypothesis 1: being educationally resilient allows individuals to overcome the negative effects of their socioeconomic status of origin in their adulthood.

- Hypothesis 2: the expected positive wage difference favouring resilient individuals over disadvantaged but non-resilient disadvantaged cannot be explained exclusively by achieved educational level.

To contrast both hypothesis, we need information on the individuals' whole life cycles, that is, from their initial socioeconomic background in adolescence and their educational achievement, to the wages they earn in adulthood. Then, to analyse the whole life cycle from individuals' years in education through to adulthood, in this study we use the European Statistics of Income and Living Conditions (EU-SILC) database, which provides not only economic and educational information on the individuals surveyed in adulthood, but also information on their family background for the case of Europe between the years 2005 and 2019. This extensive

statistical database, only available upon request to Eurostat, is unique in the European context. Due to its rich statistical content, an indicator of individuals' initial socioeconomic status can be constructed with which to examine the link between educational resilience and economic conditions in adulthood, which is an index similar to that used in PISA (the ESCS index).

The paper is structured as follows. After this introduction, the literature is reviewed in section 2; section 3 describes the data and the methodology used; the results are presented in section 4 together with some public policy recommendations; finally, the main conclusions are reported in section 5.

4.2 Literature review

An individual's socioeconomic background can have a cross-cutting effect on their living conditions throughout the whole life cycle. Consequently, there is an extensive and above all varied range of approaches to this question in the literature, both in its methodology and its aims Pintelon et al., 2013. However, the differences between individuals according to the economic capacity[1] of their parents or guardians have traditionally been studied through intergenerational mobility analysis and the social elevator.

The contexts in which socioeconomic patterns are repeated between generations reflect scant intergenerational social mobility. In these cases the social elevator does

[1]Refers to the individuals' socioeconomic background, which is undoubtedly made up of various factors, not all of which are economic.

not work effectively and has negative consequences for society as a whole (OECD, 2018a) . The lack of intergenerational mobility is often explained using the term "sticky", meaning that individuals from lower social classes, sticky floor, and those from more advantaged social classes, sticky ceiling, are more likely to remain in the same social level in which they were born (OECD, 2018a), a phenomenon that affects the disadvantaged more negatively.[2]

The term "equality of opportunity", formalised for the first time in economics by Roemer (1998), referred to a broad equality of opportunity (income, wealth, etc). This author distinguished between "circumstances", which are beyond the individual's control, and "efforts", which do depend on the individual. He used this distinction to argue that inequalities fall into two types: inequality in efforts and inequality in opportunities (originating in "circumstances"). This second type of inequality would explain why socioeconomically disadvantaged individuals had lower incomes, simply because of their status.

Since the publication of Roemer's book (1998), many studies have analysed equality of opportunities. Most of these studies examine the evolution and differences between countries in terms of equality of opportunities in the purely economic context, and few analyse the relationship between educational inequalities and their consequences for income inequalities Checchi and van de Werfhorst, 2017; Solga, 2014. In a country with a high level of inequality, the income of a person from a

[2]Note that when intergenerational mobility is analysed through the lens of equal opportunities, what tends to be studied is relative intergenerational mobility, that is, taking into account relative, not absolute, changes between generations (OECD, 2018a).

disadvantaged socioeconomic background would be negatively affected in adulthood (Brzezinski, 2015; Marrero & Rodríguez, 2012; Suárez Álvarez & López Menéndez, 2021).

In the case of Europe, some studies have found the highest levels of equality of opportunities in the Nordic countries (Brzezinski, 2015; Marrero & Rodríguez, 2012; OECD, 2018a), whereas countries in eastern Europe and the Mediterranean occupy the worst positions Marrero and Rodríguez, 2012; Suárez Álvarez and López Menéndez, 2021. Note that in general terms, Europe is better placed than other world regions in terms of equality of opportunities, although it is not evolving in an especially positive direction (Alvaredo et al., 2018).

However, the present study differs from previous research in that it focuses on the least advantaged individuals and analyses how the education system, through resilience, can intervene in their adult lives. The concept of resilience in the sense we use in this study has a diffuse origin, that could be partially attributed to psychology. The first educational studies of this century were based in the United States (Borman & Overman, 2004; Gordon Rouse, 2001) with different definitions of when a student can be considered resilient, using also different kinds of variables to discern that. In any case, both studies tried to find the resilience determinants at individual and also at school level.

The popularisation of resilience in the field of economics of education started mainly with the OECD documents and the use of the PISA survey. In 2011, the OECD published a book entitled "Against the Odds: Disadvantaged Students Who

Succeed in School" (OECD, 2011), which provided the first analyses of resilient students in 55 countries with a similar objective to the previous studies: try to find the resiliency determinants. After this publication, a number of relevant papers on resilience as a methodology for measuring equality of opportunity began to emerge with a similar objectives as the previous ones (Agasisti & Longobardi, 2014, 2017; Agasisti et al., 2017; Borman & Overman, 2004; Cordero & Mateos-Romero, 2021; Gordon Rouse, 2001; OECD, 2011, 2018b; Vicente et al., 2021; Wills & Hofmeyr, 2019). Moreover, this concept was used also for public policy recommendations in order to improve the equality of opportunities inside education system, mainly using the expenditure in education (Agasisti et al., 2017; Vicente et al., 2021). The results showed that the expenditure in education is only relevant in terms of resilience, i.e. equality, for economically disadvantaged countries (Agasisti et al., 2017; Vicente et al., 2021).

If there is no equality of opportunity inside education system, it is difficult to find real equality in more general terms since education is regarded as the main driver of the social elevator (Ermisch & Francesconi, 2001b; OECD, 2018a). Indeed, if this is the case, not only will it fail to drive the social elevator, but it will become another source of inequality. This is because the educational level a person achieves does not depend wholly on them, but the "circumstances" Roemer referred to are also important (Palomino et al., 2019). If that were the case, the well-known "Matthew effect" would occur; that is, only advantaged students would achieve educational success and this would translate into better living conditions and wages in adulthood.

Put another way, the education system would exacerbate the social differences rather than mitigate them, shifting away from the functionalist theory mentioned above.

Similarly, there is evidence to show that these "circumstances" not only affect the level of education achieved, but also which field of studies is chosen within a given educational level (Campbell et al., 2022) or the quality of educational institution attended (Chetty et al., 2017). Individuals from disadvantaged environments, even though they may have a similar academic level to others, are less likely to enroll on university degrees with higher entrance requirements and are also less likely to take degrees leading to jobs that are better paid for reasons that are not strictly economic (Campbell et al., 2022). At the same time, individuals from advantaged backgrounds are more likely to study throughout their lives (lifelong learning), whether in formal educational settings or otherwise (Pérez et al., 2012).

Growing up in a difficult environment can have consequences in adult life beyond the level or quality of education received and the level or amount of wage earned, although these factors are clearly related. Individuals from a disadvantaged social class also tend to have poorer employment prospects and are more likely to be unemployed (Lahtinen et al., 2020; McGinnity & Hillmert, 2004). Furthermore, the general consensus in the literature is that health inequality is related to income, in Europe as well as other regions (Hernández-Quevedo et al., 2010), as individuals with lower incomes are also those with the poorest health. This may also be related to a lack of rest, type of employment activity and occupation, and previous education (Hernández-Quevedo et al., 2010).

However, growing up in a disadvantaged environment and successfully overcoming adversities may be related to certain skills such as the capacity for effort or motivation; that is, soft skills may be important for educational resilience (Vicente et al., 2021) and could be associated with preschool education (Cordero & Mateos-Romero, 2021) where they can be developed more easily (Heckman, 2011).

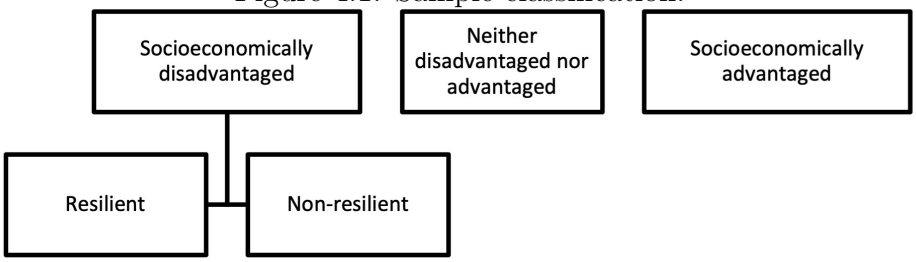
Therefore, although education should be instrumental in reducing the inequalities an individual is born with, as we have seen above this is not always possible, and may even be the cause of further inequalities. In the present study we examine the differences between individuals from different backgrounds and with different academic achievements, and examine the validity of education as a social elevator through educational resilience.

4.3 Data and methodoloy

The methodology we propose is novel and is based on constructing this socioeconomic background index to estimate expected educational level using a multilevel ordered probit model (pseudo-ESCS). Based on this result, resilient individuals are considered to be those who exceed their expected educational performance sufficiently given their socioeconomic background (see the methodology section for a more thorough definition). Educationally resilient individuals are defined with this methodology, a technique that is novel in two ways, not only in how it defines resilient individuals, but also because it links academic past with present wages.

Given that the necessary, but not sufficient, condition for an individual to be resilient is socioeconomic disadvantage, the sample is divided into four socioeconomic categories using the constructed index: resilient, non-resilient disadvantaged, advantaged, and other (neither disadvantaged nor advantaged); Figure 4.1 shows these categories. Using all the useful available information, we apply three-level multilevel regressions known as multilevel hybrid models (Mijs, 2019; Schmidt-Catran, 2014; Schmidt-Catran & Fairbrother, 2015), in which time, waves and countries can be considered. These regressions can be used to compare, using categorical variables, the different types of individuals according to their socioeconomic background and their educational achievement.

Figure 4.1: Sample classification.



Source: own elaboration.

Our goal is to analyse the effects of educational resilience on wages life conditions in adulthood. We use the wage per hour in terms of purchasing power parity (PPP) as a proxy of the individuals' life conditions in adulthood [3]. The results show that education does work as an upward social mobility elevator, but imperfectly. There is a positive gap that favours individuals coming from more advantaged family situ-

[3]Several control variables (sex, age, occupation, GDP per capita, etc.) are used in the sample with particular importance given to educational level achieved.

ations or contexts, which means that resilient individuals hit a glass ceiling because of certain circumstances and characteristics intrinsic to their socioeconomic status. Moreover, related to the second hypothesis, it seems that on its own, resilience does not lead to higher wages, and soft skills are overshadowed.

4.3.1 Data

The European Statistics of Income and Living Conditions (EU-SILC) database used in this study covers a large number of countries, including all European Union member states. The survey is carried out independently by each country's statistics institute, although it is coordinated and standardised by Eurostat. Access to the database is limited and is only granted after a formal request has been analysed and approved by Eurostat. Given the objectives of the present study, three waves of the survey were used for most of the study (2005, 2011 and 2019) since these waves include the module "Intergenerational transmission of disadvantages", which provides information on a surveyed individual's situation in adolescence.

The EU-SILC was chosen as the database for this study because of the module mentioned above, which includes a survey with questions about the socioeconomic conditions of the household when the surveyed individual was approximately 14 years old. This complimentary data on family background of the surveyed population with information on wages makes this survey particularly appropriate for studying intergenerational mobility and inequality.

Although the EU-SILC survey does not provide precise information on the indi-

vidual's family income, since information on income is limited to a subjective question[4], it does contain information about the parents' employment and education, from which an approximation can be made of the individual's initial socioeconomic background. To make this approximation, we follow a similar methodology to that used by the OECD in PISA (OECD, 2016), the point of departure for the present article. This methodology, known as principal component analysis, uses data on the parents' occupation (measured in ISCO-88 or ISCO-08) and education (highest level attained) to yield a single variable: the principal component. This variable is used to reproduce the Index of economic, social and cultural status or ESCS of PISA, that is, the initial socioeconomic context (socioeconomic status or SES), thus creating a pseudo-ESCS.

The construction of this pseudo-ESCS takes into account the sample weightings through a polychoric correlations matrix, which yields a principal component that explains most of the total variance (about 60% in the three waves), which according to the previous literature is well above the sufficient level (Howe et al., 2012; Vyas & Kumaranayake, 2006). This index allows us to define as initially socioeconomically disadvantaged those individuals who are below percentile 33 for their country (Agasisti et al., 2017; OECD, 2011; Vicente et al., 2021), although robustness tests were carried out successfully with percentiles 20 and 50 with the same results.

The aim of this study is to analyse the effects of educational resilience on wages

[4]Because of these limitations in most databases, TSTSLS (two-sample two-stage least squares) methodology is needed for studies similar to this one (Cervini-Plá, 2015; Ermisch & Francesconi, 2001a), although it is not free of criticism (Jerrim et al., 2015).

received in adulthood.[5] The approach is by individual rather than by household, so variability is not lost and the transmission from the individual's younger stage to adulthood remains true to that individual. Wage is measured in terms of gross PPP euros per hour,[6] taking into account the number of hours[7] and months worked (Schäfer & Gottschall, 2015).

Most of the explanatory variables are included as control variables since, as we will see below, the real interest in the analysis lies in the dummy variables incorporated in the regressions, referring to the individuals according to the socioeconomic environment, that split the sample in four categories: disadvantaged, resilient, advantaged[8] and the rest.

Two types of control variables are used: those referring to the individual and those referring to the country. Individual controls are essentially sex, age (and potential decreasing returns), country of birth (the same as that of the survey, different but in the EU, or different but outside the EU), employment activity (one-digit NACE), civil status, full-time work or not, and type of occupation (high, medium and low, based on ISCO-88 and ISCO-08). Maximum educational level attained deserves separate mention as it has a key role in this study and takes four values from primary education to higher education (see Table 4.1 for more information).

[5]Only individuals between the ages of 35 and 50 years old are considered, thereby avoiding irrelevant or extreme results.

[6]In this way we mitigate the possible biases entailed in the individualist approach, particularly in the case of women and the selection problem (Cervini-Plá, 2015).

[7]Weekly hours were multiplied by 4.2 (average number of weeks per month) to obtain monthly hours (Schäfer & Gottschall, 2015).

[8]Advantaged individuals are those above percentile 66 of the variable measuring socioeconomic background (pseudo-ESCS) for their country of origin.

Table 4.1: Descriptive structure of the sample.

		Sample	
		Nº obs.	%
Gender	Male	55054	50.6
	Female	59050	49.4
	Total	114104	100
Country of birth	Same as residence	104726	90.9
	Any EU25 country	4061	2.5
	Any other country	5317	6.6
	Total	114104	100
Economic activity sector	Artistic and other activities	4703	4.3
	Financial and insurance activities	4017	3.9
	Professional and administrative activities	7936	7.7
	Health and social services activities	11509	11
	Public administratio and defense	11959	10.8
	Trade and repair	14223	12.4
	Agriculture	2835	1.9
	Construction	7158	6
	Education	11823	9.4
	Hospitality	3764	3
	Manufacturing and others	24682	21.1
	Transport, storage and communication	9494	8.7
	Total	114103	100
Occupational level	Low	27079	21.1
	Medium	38013	33
	High	46855	45.9
	Total	111947	100
Marital status	Married	35596	34.3
	Not married	78539	65.7
	Total	114135	100
Level of education	Primary education	6404	3
	Lower secundary education	13474	9.6
	Upper secondary education	56337	50.9
	Tertiary education	37920	36.5
	Total	114135	100
Full-time employment	No full-time employment	13991	16.6
	Individuals working full-time	100671	83.4
	Total	114662	100
Age	Mean age	42.4	
Gross hourly wage	Median hourly wage	11	

Note: Percentages, means and medians obtained using the sample weights.
Source: Eurostat (EU-SILC) and own elaboration.

The country control variables are macroeconomic variables that take into account variations in economic development among countries and their economic cycles, namely GDP per capita and level of inequality measured by the Gini index (based on equivalent disposable income). Both variables are from Eurostat.

The final sample on which the main results are based is shown in Table 4.1, which displays the distribution of the variables. The total sample, taking into account sample weightings, represents around 110 million individuals. It is also equally balanced in terms of sex, and the majority of the individuals were born in the survey country, are married and reached secondary education.

4.3.2 Methodology

We used the constructed variable initial socioeconomic background (pseudo-ESCS) to identify individuals considered educationally resilient, namely those who achieved a higher educational level than expected, given their disadvantaged socioeconomic background. This approach to defining resilience, although conceptually similar to previous work (Agasisti & Longobardi, 2014, 2017; Agasisti et al., 2017; Borman & Overman, 2004; Cordero & Mateos-Romero, 2021; Gordon Rouse, 2001; OECD, 2011, 2018b; Vicente et al., 2021; Wills & Hofmeyr, 2019), is technically superior, since resilient individuals are identified in a novel way with a more complex methodological technique that, unlike previous studies, takes into account different environmental effects by country with an ordered categorical dependent variable (Vicente et al., 2021) . The main advantage of this technique is that it does not assume

homogeneity across countries of the environmental effect on achieved educational level and allows their effects to be isolated.

Thus, unlike previous studies that have used PISA scores, in this study we use a multilevel ordered probit in which the only explanatory variable is socioeconomic background X_{ij}, the pseudo-ESCS index, and where the dependent variable is the educational level achieved, which takes four values (Table 4.1).

Equation 4.1 expresses the model considered, which is applied to the three waves of the module "Intergenerational transmission of disadvantages". This equation represents the multilevel ordered probit in terms of latent response (y^*_{ij}). As can be seen from the equation, this is a multilevel model with a second-level random intercept (δ_{0j}) and random slope (δ_{ij}): [9]

$$y^*_{ij} = \gamma_{01} X_{ij} + \delta_{0j} + \delta_{1j} X_{ij} + u_{ij} \tag{4.1}$$

Where i =individual and j =country

We calculated the expected value given the estimated probabilities [10] for each individual by considering the estimated probability for each educational level $\hat{y}_{ij}$ (Salvador et al., 2014) and by taking the difference from the actual educational level achieved weighted by the expected value ($[y_{ij} - \hat{y}_{ij}]/\hat{y}_{ij}$). Given this percentage of

[9] In calculating the model we used sample weightings rescaled following expert advice (Carle, 2009; Rabe-Hesketh & Skrondal, 2006); specifically, we use the method that equates the apparent size of the group to the real size, although the debate on how to rescale weightings remains open.

[10] Clearing the differential effect of socioeconomic background by country in order to make it the same across individuals from the different countries.

educational surprise or disappointment, resilient individuals are those who, as well as coming from disadvantaged socioeconomic backgrounds, are above percentile 66 of those who achieved a higher educational level than expected ($[y_{ij} - \hat{y}_{ij}]/\hat{y}_{ij} > 0$); when robustness tests were carried out with percentiles 50 and 75, the main results held.

To analyse differences in wages between individuals according to their initial socioeconomic background, we used multilevel hybrid regressions at three levels (Equation 4.2), since this technique allows us to use all the waves in the same regression, thereby maximising the number of observations while taking advantage of the information from the wave and the country each individual belongs to.[11] The dependent variable is gross wage per hour worked (w_{ijk}) with the categorical variables that classify the sample according to the pseudo-ESCS, education and the other control variables as first-level explanatory variables (X_{ijk}), as well as those referring to higher levels (Z_{jk} and $\hat{Z}_k$). This type of multilevel regression is one of the best options for working with surveys such as this one, although it is not widely used (Mijs, 2019; Schmidt-Catran, 2016; Schmidt-Catrand and Fairbrother, 2016).

$$w_{ijk} = \beta_0 + \beta_1 X_{ijk} + \gamma_{within}(Z_{jk} - \hat{Z}_k) + \gamma_{between}\hat{Z}_k + \delta_k + \epsilon_{jk} + u_{ijk} \qquad (4.2)$$

Where i =individual, j =country-wave and k = country

[11]The analysis is restricted to those who are not self-employed to ensure proper standards of reliability. Weights were rescaled as in equation 1.

As can be seen in Equation 4.2,[12] the individuals (i) from the three waves are grouped into two levels. Individuals from the same country and wave are grouped in the second level (j) while individuals from all the waves from the same country are grouped in the third level (k). The individual or first-level variables are represented by (X), and the country level variables are represented by (Z). However, the second-level variables or j represent fluctuations in each wave from the country average ($Z_{jk} - \hat{Z}_k$) while the third-level variables or k are the average for the period $\hat{Z}_k$ for each country. [13]

Therefore, after classifying the sample according to economic background and resilience, we now study the effect that being resilient has on wage per hour with models similar to Equation 4.2. The categorical variables that classify the sample into four categories and the control variables allow us to make the pertinent comparisons, taking full advantage of the available information thanks to the multilevel hybrid models.

4.4 Results

Education systems should guarantee that students can achieve successful educational results regardless of their family's socioeconomic background. In other words, according to Roemer (1998), the factor that determines students' educational success

[12] A dummy variable is added per year to control for time effects (fixed effects).

[13] Therefore, the variables finally used in the regression of the country level are the differences from the average in each wave of GDP per capita data and the Gini index in level two and the average for the period of these variables in level three.

should be their "efforts" and not their "circumstances". This means that there will be resilient students who successfully overcome the disadvantages of their socioeconomic background and who obtain good educational outcomes that allow them to enjoy better wages as adults, thereby reducing or eliminating the effects of their initial socioeconomic background.

In this section we first identify the resilient individuals and the patterns and characteristics that differentiate them, including wage per hour, before testing our proposed hypotheses.[14]

4.4.1 Who are the resilient students?

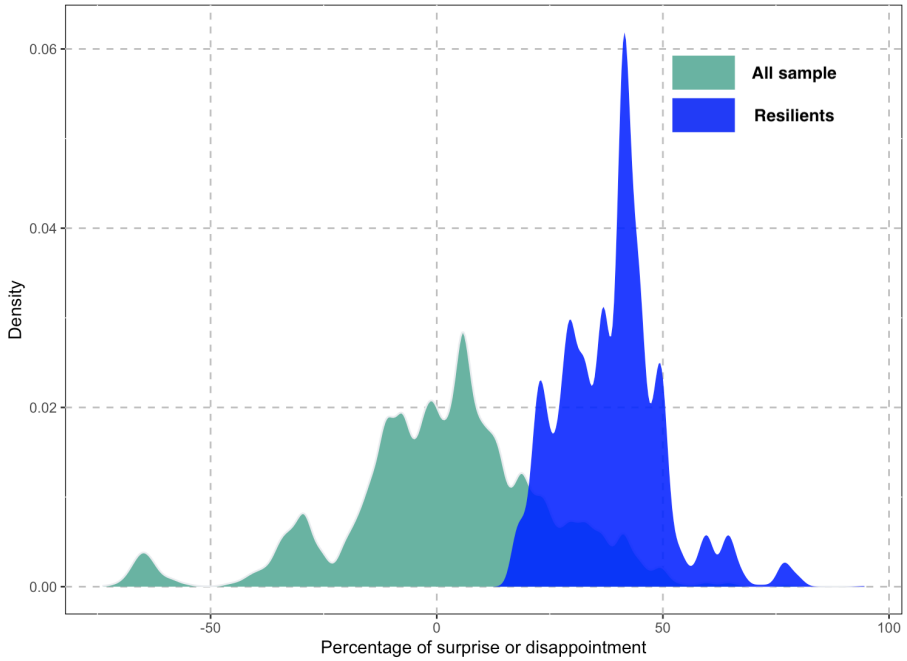
Figure 4.2 presents the distribution of the percentage of educational surprise ($[y_{ij} - \hat{y}_{ij}]/\hat{y}_{ij} > 0$) or disappointment ($[y_{ij} - \hat{y}_{ij}]/\hat{y}_{ij} < 0$) for both the total sample and for the resilient individuals only. The figure shows that the models used to define resilient individuals are relatively accurate, since the distribution of the total sample is concentrated close to surprise level 0, suggesting that the model predicts educational level accurately because the number of surprises and disappointments is small.

The distribution of resilient individuals is exceptional because of the way they are defined. As Figure 4.2 shows, most of these individuals are concentrated between surprise levels of 25% and 50%, although some of them surprise outside these

[14]Note that the results shown in this section are robust to the definition of disadvantaged to 20% and 50% of the environmental variable defined by the authors and the definition of resilience with surprise levels of 50% and 75%.

percentages. Recall that to be classified as resilient, individuals must have grown up in a relatively disadvantaged socioeconomic environment, and that an expected educational level is calculated according to that background. Therefore, the lower the socioeconomic background index, the lower the expected educational level, given the positive correlation between the two. Notice that not being resilient, given the relatively low socioeconomic background, does not imply failure.

Figure 4.2: Distribution of the percentage of educational surprise or disappointment for the total sample and resilient individuals.



Source: Eurostat (EU-SILC) and own elaboration.

Figure 4.3 displays the relationship between the socioeconomic background index and the percentage of educational surprise or disappointment. This figure comprises a cloud of dots that is clearly divided according to achieved educational level and that, in addition, differentiates between resilient and non-resilient individuals. For a

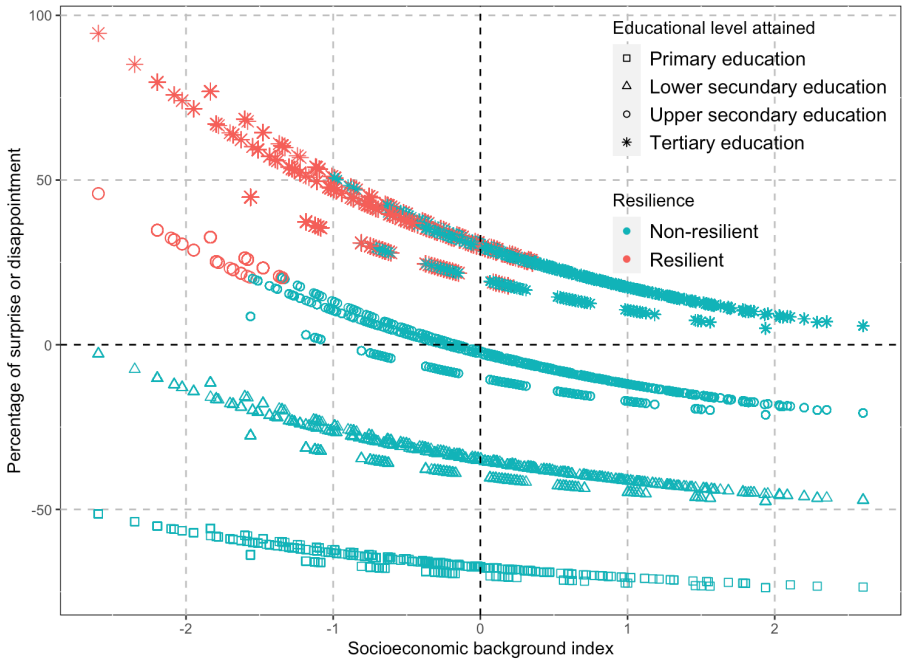
given educational level, we can see that the percentage of surprise or disappointment varies according to the individual's socioeconomic background. This implies that, for example, achieving the maximum educational level will be a surprise close to zero for the most advantaged individuals, but a surprise of over 50% for those with a lower pseudo-ESCS index, clearly showing the difficulties associated with an initial disadvantaged socioeconomic background.

Therefore, Figure 4.3 allows us to identify the surveyed individuals who were resilient during their years of education, by reaching an educational level sufficiently higher than that expected. The majority of these individuals are found in the first quadrant, although not all the individuals in that quadrant are resilient. This is because the definition of disadvantaged is relative to country of origin. Not all the individuals in this quadrant are disadvantaged, nor are all the disadvantaged individuals in that quadrant resilient.

Individuals denoted by the colour orange in Figure 3 are those who meet the two conditions to be classified as resilient and are those who represent the disadvantaged population who have successfully overcome adversities. The higher the number of this type of individual, the greater the equality of opportunity in the education system.

Table 4.2 presents the distribution of resilient individuals, disadvantaged non-resilient individuals, and advantaged individuals in the control variables used for the multilevel hybrid regression in the next section, as well as their distribution throughout the sample and the average wage per hour for each type of individual.

Figure 4.3: Relationship between the percentage of educational surprise or disappointment and the socioeconomic environment of origin.



Source: Eurostat (EU-SILC) and own elaboration.

The first notable difference is the employment sector of resilient individuals: they are highly represented in sectors related to health, public administration and education. In these three sectors the proportion of resilient individuals is clearly higher than the disadvantaged individuals, probably related to the educational level achieved, and also higher than the advantaged individuals, for whom we can infer a different pattern in their choice of employment sector, although they are less educated too.

In type of occupation, it is noteworthy that a higher proportion of the resilient individuals carry out tasks in the upper levels of the classification, even above the advantaged individuals. This must be related to the lower proportion of individuals with higher education among the latter group than the former. However, although

resilient individuals have a higher level of education than advantaged individuals, proportionally, this is not transferred to types of employment: there is a 36 percentage point difference in the proportion of individuals with the highest educational level in the two groups in favour of the resilient individuals, while this difference in terms of high occupational levels is around 6%. These results seem to indicate a different pattern not only in sector of activity, but also in type of occupation, where the effect of education may be limited due to the intrinsic socioeconomic characteristics of the advantaged individuals.

Bearing in mind the differential patterns between different types of individuals, it was to be expected that those starting out from a disadvantaged socioeconomic background, but who exceeded expectations and became resilient, would obtain higher wages per hour in adulthood than those from disadvantaged backgrounds who did not (Table 4.1). Yet, once the education effect is removed, higher wages could be expected for resilient individuals because of all the personal variables that cannot be controlled (Hypothesis 2).

However, we know less about the difference between resilient individuals and socioeconomically advantaged individuals. Given the educational level attained and the soft skills the resilient individuals showed in their education, it could be expected that there will be no differences between these two types after controlling for, mainly, education (Hypothesis 1), but at the same time the advantaged individuals have other kinds of resources.

Table 4.2: Comparison between resilient, disadvantaged non-resilient and favoured individuals. Frequencies in percentages and means.

		Disad.		
		Resilient	Non-res.	Advan.
Classification distribution	Over all sample	8.5	27.6	35.2
Gender	Male	46.8	53	49.9
	Female	53.2	47	50.1
Country of birth	Same as residence	90.4	89.4	89.8
	Any EU25 country	1.8	2.7	3
	Any other country	7.8	7.9	7.2
Economic activity sector	Artistic and other activities	3.4	4.6	4.3
	Financial and insurance activities	4.5	2	5.2
	Professional and administrative activities	7.8	6	9.2
	Health and social services activities	15	9.2	11.4
	Public administratio and defense	13.9	8.3	11.8
	Trade and repair	0.8	3.2	1.1
	Agriculture	8.4	15.4	10.3
	Construction	4.3	8.3	4.4
	Education	16.8	3.7	12.8
	Hospitality	1.3	4.5	2.4
	Manufacturing and others	16	26.5	17.9
	Transport, storage and communication	7.7	8.4	9.2
Occupational level	Low	11.6	33.6	13.5
	Medium	19.8	46.3	23.7
	High	68.6	20	62.8
Marital status	Married	34.5	31.1	36.3
	Not married	65.5	68.9	63.7
Level of education	Primary education	0	7	1
	Lower secundary education	0	21.5	4.1
	Upper secondary education	8.4	71.5	39.5
	Tertiary education	91.6	0	55.4
Full-time employment	Individuals working full-time	84.6	81.8	85
Age	Mean age	42.6	43.3	41.7
Gross hourly wage	Median hourly wage	15	9.2	12.3

Source: Eurostat (EU-SILC) and own elaboration.

4.4.2 Hourly wage effects

Wage received is one of the variables that has the greatest effect on individuals' quality of life as it is associated with aspects such as enhanced enjoyment of leisure and better health. To analyse the effects of individuals' resilience on wages received in adulthood, we use multilevel hybrid models at three levels, described in the

methodology section, that control both for wave and for country. These regressions, presented in Table 4.3, are the result of combining the three EU-SILC waves with information on initial socioeconomic background (2005, 2011 and 2019), where the dependent variable is the logarithm of the wage per hour.[15]

Table 4.3 presents eight models; the first four compare resilient and non-resilient disadvantaged individuals, while the second four compare resilient and socioeconomically advantaged individuals. Both comparisons follow the same structure: first the model is applied controlling for all the control variables except those related to occupation, activity and education; these latter variables are then added as controls in the following models. This is done because our aim is to isolate the pure effect of being resilient, but being resilient could have an effect on the kind of job they have, for example. Some models only differentiate by the base or reference category of the individual's socioeconomic status, such as model 1 and model 4, model 2 and model 5, etc.

Model 1 of Table 4.3 shows the average effect on wages of being resilient compared to that for non-resilient socioeconomically disadvantaged individuals, the reference category in this case. As can be seen, there is a significant difference between the two in favour of resilient individuals, which remains significant when level of occupation and sector of activity are controlled for (model 2), although the difference is substantially lower. Only when educational level is controlled for, as in models 3 and 4, does the significance of the categorical variable that identifies resilient

[15]All the models presented in this subsection are log-lin models, as in most previous research on determinants of wages.

Table 4.3: Multilevel hybrid regressions for comparison in hourly wage. EU-SILC (2005, 2011, 2019)

Dependent variable: Natural logarithm of the hourly wage																								
	Resilient vs non-resilient disadvantaged												Resilient vs socioeconomically advantaged											
	Model 1			Model 2			Model 3			Model 4			Model 5			Model 6			Model 7			Model 8		
Individual-level variables	Coefficient		S.E.	Coefficient		S.E.	Coefficient		S.E.	Coefficient		S.E.	Coefficient		S.E.	Coefficient		S.E.	Coefficient		S.E.	Coefficient		S.E.
Resilient	**0.3**	***	**0.03**	**0.122**	***	**0.02**	**-0.01**		**0.01**	**-0.019**		**0.01**	**0.024**		**0.02**	**0.004**		**0.01**	**-0.086**	***	**0.02**	**-0.056**	***	**0.01**
Socioeconomically advantaged	0.276	***	0.03	0.118	***	0.01	0.076	***	0.01	0.037	**	0.01	Base category			Base category			Base category			Base category		
Non-resilient disadvantaged	Base category			Base category			Base category			Base category			-0.276	***	0.03	-0.118	***	0.01	-0.076	***	0.01	-0.037		0.01
Socioeconomically non-classified	0.136	***	0.02	0.059	***	0.01	0.025	***	0.01	0.011		0.01	-0.14	***	0.01	-0.059	***	0.01	-0.051	***	0.01	-0.026		0.01
Gender (Female=1)	-0.111	***	0.01	-0.118	***	0.01	-0.138	***	0.01	-0.125	***	0.01	-0.111	***	0.01	-0.118	***	0.01	-0.138	***	0.01	-0.125	***	0.01
Age	0.033	***	0.01	0.033	***	0.01	0.035	***	0.01	0.034	***	0.01	0.033	***	0.01	0.033	***	0.01	0.035	***	0.01	0.034	***	0.01
Age (square)	0	***	0	0	**	0	0	***	0	0	**	0	0	***	0	0	**	0	0	***	0	0	**	0
Country of birth (Same as residence =0)																								
Any EU25 country (=1)	-0.161	***	0.03	-0.108	***	0.02	-0.161	***	0.03	-0.117	***	0.02	-0.161	***	0.03	-0.108	***	0.02	-0.161	***	0.03	-0.117	***	0.02
Any other country (=2)	-0.203	***	0.04	-0.125	***	0.03	-0.185	***	0.04	-0.128	***	0.03	-0.203	***	0.04	-0.125	***	0.03	-0.185	***	0.04	-0.128	***	0.03
Marital status (Married=1)	0.06	***	0.01	0.042	***	0.01	0.051	***	0.01	0.04	***	0.01	0.06	***	0.01	0.042	***	0.01	0.051	***	0.01	0.04	***	0.01
Full time employment	0.131	***	0.02	0.061	***	0.02	0.098	***	0.02	0.053	**	0.02	0.131	***	0.02	0.061	***	0.02	0.098	***	0.02	0.053	**	0.02
Occupational level (Low=0)																								
Medium				0.076	***	0.01				0.06	**	0.01				0.076	***	0.01				0.06	**	0.01
High				0.348	***	0.03				0.268	***	0.02				0.348	***	0.03				0.268	***	0.02
Economic activity sector (Agriculture=0)																								
Artistic and other				0.109	***	0.04				0.097	***	0.04				0.109	***	0.04				0.097	***	0.04
Financial and insurance				0.483	***	0.05				0.446	***	0.04				0.483	***	0.05				0.446	***	0.04
Professional and administrative				0.205	***	0.03				0.182	***	0.03				0.205	***	0.03				0.182	***	0.03
Health and social services				0.219	***	0.04				0.203	***	0.04				0.219	***	0.04				0.203	***	0.04
Public administration and defense				0.326	***	0.04				0.303	***	0.04				0.326	***	0.04				0.303	***	0.04
Trade and repair				0.204	***	0.03				0.196	***	0.03				0.204	***	0.03				0.196	***	0.03
Construction				0.184	***	0.03				0.189	***	0.03				0.184	***	0.03				0.189	***	0.03
Education				0.267	***	0.05				0.219	***	0.04				0.267	***	0.05				0.219	***	0.04
Hospitality				0.113	***	0.03				0.109	***	0.03				0.113	***	0.03				0.109	***	0.03
Manufacturing and others				0.276	***	0.04				0.272	***	0.04				0.276	***	0.04				0.272	***	0.04
Transport and communication				0.301	***	0.04				0.288	***	0.04				0.301	***	0.04				0.288	***	0.04
Education attained (Primary education=0)																								
Lower secundary education							0.133	***	0.03	0.106	***	0.03							0.133	***	0.03	0.106	***	0.03
Upper secondary education							0.278	***	0.04	0.2	***	0.04							0.278	***	0.04	0.2	***	0.04
Tertiary education							0.575	***	0.04	0.373	***	0.03							0.575	***	0.04	0.373	***	0.03
Second-level variables (within-country)																								
GDPpc per capita (differentiated)	0.003		0.01	0.004		0.01	0.002		0.01	0.003		0.01	0.003		0.01	0.004		0.01	0.002		0.01	0.003		0.01
Gini idex (differentiated)	-0.007		0.01	-0.009		0.01	-0.007		0.01	-0.008		0.01	-0.007		0.01	-0.009		0.01	-0.007		0.01	-0.008		0.01
Third-level variables (within-country)																								
Third-level variables (between-country)																								
GDP per capita (mean)	0.048	***	0.02	0.046	***	0.02	0.048	***	0.02	0.047	***	0.02	0.047	***	0.02	0.046	***	0.02	0.047	***	0.02	0.046	***	0.02
Gini idex (mean)	0.045		0.04	0.048		0.04	0.048		0.04	0.049		0.04	0.037		0.04	0.038		0.04	0.038		0.04	0.039		0.04
Number of observations	116,192			114,614			116,192			114,614			116,192			114,614			116,192			114,614		
Number of groups level 2	74			74			74			74			74			74			74			74		
Number of groups level 3	28			28			28			28			28			28			28			28		
Log pseudolikelihood	-74,859.59			-65,504.18			-69,715.49			-84,002.02			-74,859.59			-65,504.18			-69,715.49			-84,002.02		

Source: Eurostat and own elaboration. Note: *** denotes significance at 1%; **, at 5% and *, at 10%. Fixed time effects have been added for each wave.

individuals disappear.

Model 4 of Table 4.3 makes the same comparison, but this time all the control variables are added, including education. Keep in mind that in this model we controlled for both the direct effects of education, that is, educational level, and indirect effects related to sector of activity and occupational level, among others. Therefore, all the observable variables have been controlled for in this model and if there is any difference, it will derive from unobservable variables related to resilience.

From model 4, we can conclude that there are no differences in wage, on average terms, between disadvantaged individuals who become resilient and those who do not, once these observable variables are controlled for. Therefore, despite the fact that resilient individuals earn better wages, mainly due to their higher educational level, this result confirms that resilience has no statistically significant effect. We can infer from this result that the great difference between the two groups lies in level of education, and that no unobservable variable is relevant.

This does not mean, however, that resilient individuals do not have some superior soft skills, which could be absorbed by the other variables in the model, since they are relevant in terms of labour market outcomes (Heckman et al., 2006).[16] If this were not the case, the higher motivation or the greater capacity for effort entailed in educational resilience may not be reflected in wage levels, but it does facilitate a higher employment quality or greater job stability, among other examples, which go

[16]Model 4 was replicated with educational level 3 only (upper secondary education) to compare disadvantaged resilient and non-resilient individuals with the same educational level; the result was the same (model is available on request). It therefore seems to be fairly implausible that the effects of resilience are absorbed by level of education.

beyond the scope of the present study.

Model 5 of Table 4.3 shows an initial comparison without controlling for educational level nor variables related to occupation and activity between resilient individuals and socioeconomically advantaged individuals, the reference category in this case. This model reveals no significant differences between these two groups of individuals, even though the first group have a higher educational level (about 90% have the maximum possible educational level) and a higher proportion of individuals (69%) working in the best placed occupations.

A similar result is obtained in model 6 in the same table after controlling for type of occupation and sector of activity. In other words, given the sector of activity and the type of occupation, there are still no significant differences between resilient and advantaged individuals. Education appears to fulfil its aim of driving the social elevator. However, when educational level is controlled for, significant differences appear between the two groups of individuals as can be seen in models 7 and 8 in the table. Once again, therefore, it is education that explains the change in these comparisons.

Model 8 of Table 4.3 seeks to quantify the difference found between these two sets of individuals. As can be seen in the categorical variable of resilience, and bearing in mind that the reference category is now advantaged individuals, we can conclude that there is a statistically significant difference between the two sets of individuals in favour of those who faced fewer socioeconomic difficulties, a priori, throughout their lives. This unexplained difference, of 5.6%, mainly appears after controlling

for educational level, where the resilient individuals are in a better position.

This kind of residual could be considered a glass ceiling, referring to everything that prevents resilient individuals, as people from disadvantaged backgrounds, from achieving the same wage levels as those who start out from more advantaged family situations and backgrounds. Moreover, the effect of this glass ceiling may be undervalued since it is measured exclusively in terms of wage. Bearing in mind that wage represents a lower proportion of the total income of the most advantaged individuals, the glass ceiling that disadvantaged individuals must break in order to achieve the same income and wealth as the most advantaged could be much bigger.

Therefore, although resilient individuals must make a higher relative effort –economic or otherwise– and therefore their investment and efforts a priori are greater, the individual with more socioeconomic advantages will end up earning a higher wage per hour given their educational level and controlling for the other variables. Hence, we can conclude that although education is a good tool for driving the upward social elevator, it has certain limitations in that it does not fully eliminate the economic effects of environment in adulthood.

A variety of situations may explain this glass ceiling resilient individuals face. Advantaged individuals come from a background that provides them with more relational capital, and personal, professional and educational information, as well as the specific skills needed in sectors dominated by the highest social classes, which in turn are those that tend to be better paid (OECD, 2018a). Because the database provides information on educational level only, we are unable to explore details such

as academic field studied or the type of institution attended. Advantaged individuals are more likely to attend better quality schools and colleges (Chetty et al., 2017), to have access to training or education leading to better paid occupations (Campbell et al., 2022) and to continue learning outside formal settings during their lives (Pérez et al., 2012). Therefore, the greater economic advantages, resources and contacts these individuals have outweighs the potential effect of such important soft skills as motivation or effort displayed by resilient individuals in the education system.

Hence, bearing in mind that the analysis in this study cannot suggest a direct causality, the results seem to contradict our two hypotheses. The main hypothesis, that there were no differences between advantaged and resilient individuals, is contradicted by the glass ceiling mentioned above. In turn, the second hypothesis, which proposed a positive effect of resilience among disadvantaged individuals, can also be rejected in light of the results presented in this section, although with some reservations. What is clearer is that education is responsible for improving the wages of resilient disadvantaged individuals.

4.4.3 Policy recommendations

In any case, although the effects of resilience do not appear to go beyond education, greater resilience would imply a better educated disadvantaged population. For this reason, the public administration should promote and encourage educational resilience since it has positive effects on disadvantaged individuals in socioeconomic terms, which favours equality of opportunity and a more effective upward social

elevator. Economic policy recommendations should therefore be made that favour equality of opportunities in education, since this equality is then transferred, to some extent, to society as a whole.

As previous studies have demonstrated (Agasisti et al., 2017; Vicente et al., 2021), to be fully effective policies should take into account the situation of each region or country. Lack of resources can negatively affect equality of opportunity and educational resilience, which would hinder the efficient workings of the social elevator. Previous studies examining the determinants of educational resilience have found that public spending is particularly important to resilience in less developed countries with a lower per capita income (Agasisti et al., 2017; Vicente et al., 2021). For the case of countries with a higher per capita income, spending efficiency and stimulating human capital, especially teachers, are the directions that should be followed to improve resilience and with it, equality of opportunities (Vicente et al., 2021).

In turn, public policies should be designed to reduce the differences between resilient and advantaged individuals deriving from socioeconomic background. Some possible public policy in this sense would be to actively help socioeconomically disadvantaged students with assistance programs, such as scholarships or comprehensive family support.

Beside, one of the main reasons why the glass ceiling exists is that disadvantaged individuals have less information, because to a large extent they attend inferior educational institutions (Chetty et al., 2017) and study for careers that are less well

remunerated (Campbell et al., 2022), due to limitations that are not only monetary. While the first case could be partly explained by the lack of resources, this is not so in the case of choice of studies (Campbell et al., 2022), which is mainly explained by the available information and personal tastes (also influenced by initial socioeconomic background). Therefore, public policies should design any measures targeted to improve information or environmental inequalities, other than resources, such as reinforcing educational orientation or promoting education at earlier stages in life (Heckman, 2011), should be taken into account. In this sense, we consider especially relevant the career guidance's role in school to compensate the effect of the lack of information on the socioeconomically disadvantaged students (Musset & Kurekova, 2018).

Nevertheless, a cross-sectional approach should be taken to equality of opportunities, by combining policies affecting the education system with social protection policies, which could have significant effects for reducing inequalities (Solga, 2014), with all the positive consequences that can entail.

4.5 Conclusions

The principal aim of this paper was to study the implications on wages of educational resilience, mainly by comparing socioeconomically disadvantaged resilient individuals with advantaged individuals (hypothesis 1). That is, we attempted to analyse whether overcoming adversity in education by achieving a higher educa-

tional level than expected paid off in adulthood by eliminating differences related to initial socioeconomic background, or at least in terms of wage. The idea for the study stemmed from the need to continue previous work in educational economics exploring the determinants of educational resilience and the percentage of resilient students as a proxy variable for equality of opportunity in education.

To this end we used, for the first time in this field, a standardised European database, the European Statistics of Income and Living Conditions or EU-SILC with data between 2005 and 2019, but mainly using the waves that include the module "Intergenerational transmission of disadvantages" (2005, 2011 and 2019). The information these modules provide about the surveyed population's initial background was crucial for the type of analysis undertaken since it covers both initial socioeconomic background and wages in adulthood. The wealth of information provided in the EU-SILC therefore enabled us to replicate the initial socioeconomic background indicator used in PISA (ESCS), the most prestigious database used in analysis of educational resilience, for all the survey respondents through the first component of the principal component analysis. In this way we were able to connect individuals' pasts with their present as adults obtaining a pseudo-ESCS.

As well as the novel use of the EU-SILC database and the above-mentioned module, the study contributes an additional methodological innovation by identifying resilient individuals through multilevel probit regressions at two levels, the individuals and their countries. Resilient individuals are those who, given their disadvantaged socioeconomic background, have successfully surpassed the educational

level expected of them. These individuals are understood to be relatively similar to the educationally resilient individuals studied in previous literature, but have now reached adulthood.

Having identified a set of resilient individuals and classified the rest of the sample into non-resilient disadvantaged, advantaged and the rest, we compared gross wages per hour measured in purchasing power parity euros. As expected, resilient individuals earned higher wages than non-resilient disadvantaged individuals. However, once all the observable variables, especially education, were controlled for, the differences in wages were not statistically significant. We obtained this result using multilevel hybrid regressions, which is not a widely used methodology but is particularly powerful for this type of analysis. This difference was obtained by controlling for education, sex, age (and its decreasing returns), country of birth, civil status, type of working day, sector of activity, type of occupation, GDP per capita (and its fluctuations), Gini index (and its fluctuations too) as well as fixed time effects.

Given that no significant difference was found through categorical variables for the socioeconomic classification of the above-mentioned sample, it appears that there are no relevant unobservable variables at the wage level that favour resilient individuals, thus contradicting our second hypothesis, which posited the existence of positive unobservable effects for resilient individuals. This type of residual is related to the soft skills expected of individuals who have successfully overcome the adversities of the education system. However, the finding does not lead us to conclude that soft skills were unimportant for resilience, nor that they were not valued in the labour

market. In fact, the effects of educational resilience could be absorbed by the other control variables, which opens an interesting line for future research.

The main research hypothesis posited that there would be no wage differences between resilient disadvantaged and advantaged individuals, related to equality of opportunities and social mobility. This hypothesis appeared to be supported until educational level was controlled for, when significant differences began to emerge. If we take into account all the observable variables, there is a difference in favour of the most advantaged, who earn an average of 5.6% more per hour than resilient individuals. This result leads us to reject our principal hypothesis that there would be no wage differences between these two types of individuals. The finding appears to suggest that despite having overcome adversities related to their background, resilient individuals did not reach the wage levels earned by the socioeconomically advantaged, who had more resources and enjoyed more favourable conditions that combine to create what has been called the glass ceiling.

The existence of this glass ceiling may be explained by the better network of contacts, and more and better quality information available to advantaged individuals and a greater availability of resources in general. This information helps them to access better opportunities and to take better decisions on what line of study to follow in order to reach positions higher up the corporate ladder and to have more favourable conditions to develop the specific skills required in the sectors with a greater presence of higher social classes, which at the same time are the most highly paid sectors. In addition, this glass ceiling may be explained by the better education

in foreign languages or in non-formal education available to advantaged individuals, both during their years of education and throughout their working lives. All these favourable conditions available to advantaged individuals, including resources, appear to make up for and trump the expected advantages associated with the better soft skills, such as motivation or capacity for hard work, that the resilient individuals have shown during their years in education and that have allowed them to overcome the adversities associated with background in the educational setting. Furthermore, it should be noted that the glass ceiling measured in this study is exclusively based on wage and, bearing in mind that wage has less weight in the case of advantaged individuals, the difference is likely to be greater in terms of income or wealth.

Educational resilience should therefore be promoted, since although resilience, on its own, does not seem to break through the glass ceiling, the more resilient disadvantaged individuals there are, the greater the equality of opportunities will be both within and outside the education system. For this to occur, depending on the country's wealth, more and better investments should be made in economic resources that value human capital and aim to reduce the effects of socioeconomic differences between individuals from the earliest stages of education. These measures should also go beyond the education system and be combined with social protection measures to tackle the problem cross-sectionally.

In conclusion, this study has shown that educational resilience, namely disadvantaged individuals overcoming adversities during their years of education, implies an improved wage per hour related to achieved educational level. However, it appears

that resilience on its own, that is, beyond the effect of obtaining a relatively high educational level, does not have a positive effect on wage per hour. This is because resilience and education are insufficient to overcome certain limitations, and there is a glass ceiling that prevents resilient individuals from achieving the same wages as individuals from a more favourable socioeconomic background, despite the better soft skills expected.

Chapter 5

Career guidance and information inequalities in education

5.1 Introduction

There is extensive evidence of the socioeconomic background effect on the students' educational performance during secondary education, especially since the international educational assessments have become popular. This effect is a clear example of the inequality of opportunity that can be found within the educational system, with a negative effect on equality and social mobility (Ermisch & Francesconi, 2001b; OECD, 2018b). The concept "equality of opportunity" was formalised for the first time in economics by Roemer (1998), who found two sources of inequalities, one

A version of this chapter has already been submitted to the a journal in co-authorship, together with the doctoral candidate and the thesis supervisors, the international researcher Tommaso Agasisti (Politecnico di Milano, Italy).

related to the effort and the other to the circumstances. However, according to Roemer only the effort inequalities are understood as legitimate, since this effort is under the individual's responsibility, whereas circumstances are everything that is beyond the individual's control, being these inequalities illegitimate for him.

Roemer's idea about circumstances can be applied to the equality of opportunity during the educational stage. These inequalities can be classified as primary or secondary inequalities, being the first one related directly to the educational performance and the second one to the individual's path of choice (Erikson & Jonsson, 1996; Müller, 2014). Primary inequalities are related to the effect of being born and raised in a family with a given level of education and financial resources on the cognitive skills, but also to the support received at home while studying and to performing well in school (Erikson & Jonsson, 1996; Müller, 2014). Secondary inequalities are those that could explain part of the reasons why some students, given the same educational performance, choose different paths (Erikson & Jonsson, 1996; Müller, 2014), acknowledging that the budget constraint is not the unique factor (Campbell et al., 2022). Taking into account that families are the main source of information for students (Musset & Kurekova, 2018), and that information is fundamental for analysing the returns and costs of each possible next step in the students' life, the socioeconomic background could determine the decision-making process and hence the educational results. This could be related to the rational choice theory, because individuals try to make the best possible decisions with the available resources, hav-

ing the most disadvantaged individuals and families less information [1]. The best example of the influence of the socioeconomic background on the decision-making process is the misalignment between education and career expectations, as it is more frequent among the most socioeconomically disadvantaged students (Givord, 2020). These students tend to have less knowledge about the returns of education and they tend to have lower expectations too (Agasisti & Maragkou, 2022; Gore et al., 2015).

To pursue the equality of opportunities in education, career guidance could play an important role in giving learning support. In this study, we follow the definition of career guidance, applied at school level, provided by the OECD in their Career Guidance and Public Policy review, namely 'services intended to assist people, of any age and at any point throughout their lives to make educational, training and occupational choices and to manage their careers' (OECD, 2004).Consequently, career guidance counsellors at school can provide professional support by supplying the necessary information about educational options and their returns to the students and their families, especially to the disadvantaged ones (Musset & Kurekova, 2018). This could reduce the differential effect caused by the information inequality and, through that, the secondary inequalities.

Regarding the primary inequalities, it is true that they are easier to address in earlier stages of education during which attention can be paid not only to students but to their families and environments (Heckman, 2011), which can be supported, so

[1]Moreover, avoiding a loss gives more incentive than having new and better experiences, favouring the most advantaged individuals and families to motivate and give school support (Keller & Zavalloni, 1964; Müller, 2014).

they can help the children to develop skills that are important for their future (Agasisti & Cordero-Ferrera, 2013). However, career guidance should not only provide information but also should encourage expectations (Müller, 2014) and motivation, which can affect directly the primary inequality, with positive impacts on the educational performance.

In this study, we analyse the effect of having a career guidance counsellor employed at secondary schools on variables related to expectations and motivation, but also to cognitive skills like mathematics, reading, and science. To do that, we use the OECD PISA 2018 sample, composed of more than 180,000 15 years old students in 29 countries, where new and previously unused variables about career guidance have been collected. The proposed methodology is an econometric one, namely Propensity Score Matching with a novel multilevel second stage. The main variable of interest indicates whether the school offers a career guidance counsellor service, using this information to create the experimental group and the control group. With this study, we fill a gap in the literature, especially trying to analyse the career guidance heterogeneous effect on expectations, motivation, and cognitive skills for an international sample, but also using a quasi-experimental approach in the analysis of said effect (Musset & Kurekova, 2018).

We find an heterogeneous effect of the career guidance depending on the students' socioeconomic background. The effect is positive and statistically significant in the variables related to motivation and expectations, but also in mathematics, reading, and science, but only for disadvantaged students, with an increasingly large effect

as the socioeconomic level lowers. The expected mechanism is an improvement in the students' expectations and motivation thanks to the information provided, with positive effects on cognitive skills. Despite the impossibility to certainly assert that there is a causal relationship, given data and method limitations, our robust results demonstrate that providing career guidance could improve the equality of opportunities in education. Moreover, given the relevance of these results in terms of public and educational policies, we analyse the different effect of this career guidance according to the different type of economic development of the countries.

The paper is structured as follows. Following this introduction, Section 2 reviews the literature, Section 3 reports the data and the methodology, Section 4 reports the main results, Section 5 shows some sensitivity tests and Section 6 discusses the concluding remarks and provides some policy implications.

5.2 Literature Review

Career guidance is focused on helping students to make the best possible decisions during the educational stage for their future. Such an effort makes information about the labour market and educational opportunities easier to attain (OECD, 2004), improving the labour market outcomes and the social behaviour (Heckman et al., 2006). Thus, career guidance helps individuals to create achievable goals and 'meaning making' thanks to the provision of relevant information, exposing students to the realities of the world (Hughes et al., 2016; Kashefpakdel & Schleicher,

2017). This approach increases students' motivation, explaining why providing career guidance could have a positive effect on educational performance (Afzal et al., 2010; Brisson et al., 2017; Hughes et al., 2016; Kashefpakdel & Schleicher, 2017). In this paper we refer to intrinsic motivation, which does not depend on any punishment or reward, and is positively related to academic performance. (Afzal et al., 2010)

However, analysing how the career guidance is provided is a difficult task, especially in an international context, since it implies a wide range of activities and interventions like career provision, group discussions or mentoring, although personal interviews are the most used tool (Hughes et al., 2016; OECD, 2004). On the other hand, career guidance is also provided by people with different backgrounds (OECD, 2004). Moreover, policymakers have not paid enough attention to it either (Hughes et al., 2016; OECD, 2004), when the provision of this service is funded basically by public institutions (OECD, 2004; Watts, 2008).

The results obtained by previous studies indicate that, in most cases, the effect of this kind of intervention on educational achievement is positive. Hughes et al. (2016) revised more than 40 previous studies, where 60% show a significant effect of the career guidance on the educational outcome, although how this is measured varies (Hughes et al., 2016). For example, positive effects have been found on high school graduation rates (Neild et al., 2015) or staying-on rates (O'Donnell et al., 2005).

One year after the study of Hughes et al. (2016), Kashefpakdel and Schleicher

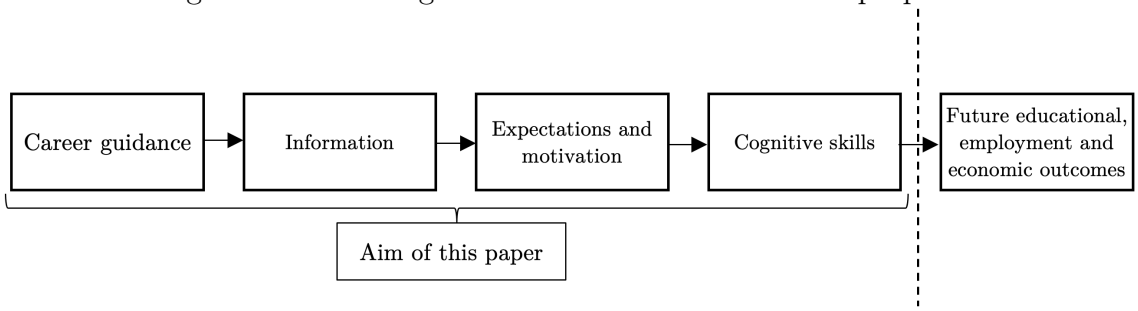
(2017) published a study which was strictly connected to ours. They used PISA 2012, where some variables related to the career guidance are available (e.g. the attendance to a careers fair, students speaking with a career advisor). The analysis was conducted for six countries (Australia, Belgium, Canada, Denmark, Finland, and Ireland) with a simple linear regression per country. The analysis showed a positive relationship between career guidance activities and educational performance in mathematics. Previously, a study assessed the relationship between the same questions and students' motivation (Kashefpakdel et al., 2016). The authors followed the same structure, with the same sample and methodology. The main conclusion is that the students who participated in career guidance activities have more positive attitudes towards the utility of schools in adulthood, being more motivated for what they do in school. Therefore, the combination of these two studies supports the mechanism proposed by Musset and Kurekova (2018): "career education helps young people to better understand the relationship between educational goals and occupational outcomes, increasing pupil motivation and focus".

Without career guidance, family background entirely defines the way of thinking about the future (Musset & Kurekova, 2018) and with this the expectations, that are lower in the case of low socioeconomic background individuals (Gore et al., 2015). This is one of the points where career guidance helps to reduce inequality, raising the expectations of disadvantaged students (Watts, 2008), since they are more likely to be misaligned with their educational performance or their capacity (Givord, 2020; Hughes et al., 2016). This important increase in the expectations of disadvantaged

students can be related to the motivation raised by the provision of information by the career guidance (Brisson et al., 2017; Hughes et al., 2016; Kashefpakdel & Schleicher, 2017), that could further increase the educational performance of said students in comparison with the expected effect on the rest of the students.

Figure 5.1 clarifies the underlying mechanism we assess in this paper given the previous literature. This figure, in line with Musset and Kurekova (2018), represents that career guidance provides useful information to students. This could positively affect their expectations and motivation, improving their educational performance. With better cognitive skills, a more hopeful future can be expected for them, although the analysis of this specific channel exceeds the purpose of this paper. Notice that this figure could imply causality, but we cannot claim it with the available data.

Figure 5.1: Career guidance effect: the mechanism proposed



5.3 Data and methods

5.3.1 Data

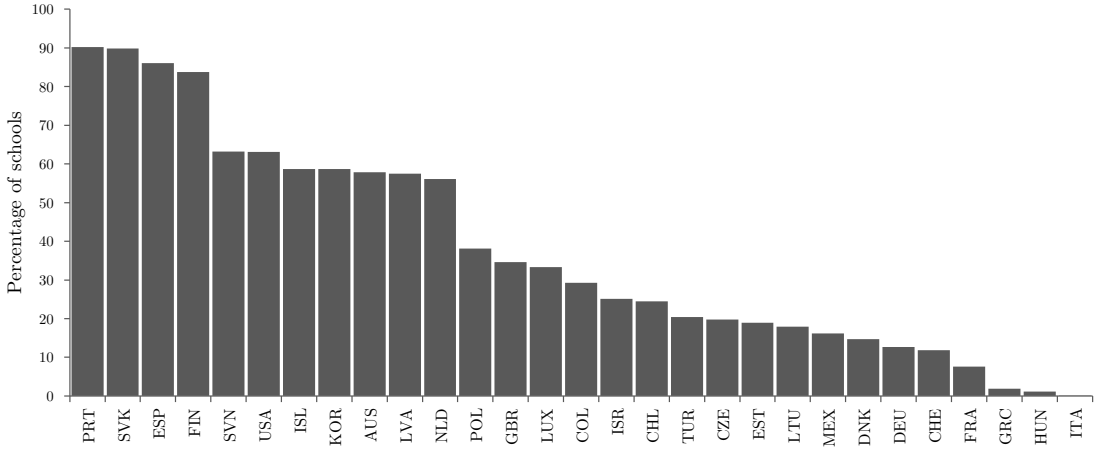
This study uses the last available wave of the OECD *Programme for International Student Assesment* or PISA, a large-scale international assessment based on the year 2018. This survey tests the students' knowledge of reading, mathematics, and science, and what they can do with that knowledge. The objective population is the 15 yeas old students group in more than 70 countries, although we only focus on the OECD countries. [2]

In PISA 2018 wave a new set of variables about career guidance is included. These variables are at school level (school questionnaire), asked directly to the school principals. These variables ask whether there is career guidance available at school and what kind of it. In our case, we have selected the variable that provides the information about whether there is or not a career guidance counsellor employed at school, since we consider that it is the cleanest, purest and most reliable one, as the "treatment" variable. The other potential variables ask whether the responsibility is shared by all or specific teachers (not professionals in career guidance services) or whether a career guidance counsellor visits the school (the frequency of visits is unknown). Figure 5.2 shows the percentage of schools with career guidance counsellors employed at school in the sample of countries considered. As it can be seen, this

[2]It has been impossible to use all OECD countries by availability of information reasons. The sample is formed by students from Australia, Switzerland, Chile, Colombia, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, Greece, Hungary, Iceland, Israel, Italy, Korea, Lithuania, Luxembourg, Latvia, Mexico, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, Turkey, and the United States.

variable has a high variability among countries, showing how different educational systems are. Notice that schools without career guidance employed at school may or may not have other types of career guidance.

Figure 5.2: Percentage of schools with career guidance counsellors employed at school. OECD countries. 2018.



Source: OECD (PISA 2018) and own elaboration

The control variables used at student level are gender, immigrant status, grade compared to the modal [3], age, socioeconomic background (ESCS index), and pre-primary school attendance (ISCED 0). Bearing in mind that we are going to study the effect of a school level variable, it is crucial to control for other variables at school level such as school type, socioeconomic background average, school size, location (located in a city or not), percentage of girls, and student-teacher ratio (see Table 5.1 for more information). Controlling for these variables is especially crucial, since the provision of career counselling could be related to the rest of the school level variables and we want to match similar students from similar schools. All

[3]The modal grade is the grade expected according to the students' age and country.

these variables, individual and school ones, have been selected following the general consensus of previous studies using PISA databases.

The socioeconomic status index (ESCS) deserves special attention for its relevance in this article. This index, constructed directly by the OECD, uses parents' wealth, maximum level of education attained, and type of job information to create this variable, understood it as the students' socioeconomic background. The mean value is 0 for the OECD sample, while the standard deviation is 1 (OECD, 2011). This index is typically used in relation to the students' country, as it is in this study, to understand their position in their society.

As we explained before, we are interested in the relationship between career guidance and variables like expectations and motivation. Thanks to the information provided by PISA 2018, we can see students' expectations using the expected occupational status (an ISEI index using ISCO codes)[4] and the motivation with the ambition learning goals index (a warm likelihood estimate index). The latter is constructed combining some questions about the students' ambitious learning goals to measure the intrinsic motivation, i.e. if its objective is to learn as much as possible. Indeed, if the value is positive implies that the student has more ambition to learn than the OECD average.[5] The relationship of the career guidance with the cognitive skills is evaluated using the test score in mathematics, reading, and science. Indeed,

[4]See OECD (2018), Equity in Education: Breaking Down Barriers to Social Mobility, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264073234-en., for more information

[5]See OECD (2019), PISA 2018 Results (Volume III): What School Life Means for Students' Lives, PISA, OECD Publishing, Paris, https://doi.org/10.1787/acd78851-en., for more information

this information is provided with ten plausible values for each subject, which are random values from the posterior distributions, i.e. a range of possible values for each student given its performance during the survey (OECD, 2009). In our case we use just use one plausible value, since this produces unbiased estimations, as the OECD has proven with some simulations (OECD, 2009).

Table 5.1 contains the descriptive statistics of our sample, with 188,218 students nested in 7,732 schools nested in 29 countries, where sample weights have been used. The sample is perfectly balanced in terms of gender, with 14% of immigrants and a majority of public schools. Some variables are defined to be 0, in average terms, for the OECD sample. However, in our case we cannot use the whole OECD sample, so we could expect to have some indices greater or lower than 0, like for example the ESCS index or the ambition learning goals index.

In the same table, we have the descriptive statistics differentiating between the sample of the socioeconomically disadvantaged students and the sample of the most advantaged ones. For this table we define disadvantaged students as those who are below the 33% percentile in the ESCS index and advantaged students as the ones who are above the 66% percentile in the same index, in country relative terms. We aim at differentiating to assess the potential heterogeneous effect of career guidance. As we can see in the student level control variables, disadvantaged students tend more to be in lower grades than the modals ones and to have not attended pre-primary schools. In the advantaged sample, there is a lower proportion of first-generation immigrants. In relation to the outcome variables, i.e. the variables we are interested

in, disadvantaged students are generally worse in all of them. It is no surprise thay disadvantaged students have worse cognitive skills results, but we knew less about the non-cognitive skills. However, given the mechanism proposed previously, the results in Table 5.1 are in line with our hypothesis and the more socioeconomically advantaged students tend to have higher expectations and better motivation. The differences in the school level variables are less interesting and relevant, although the proportion of advantaged students attending independent private schools is higher.

We have the same information differentiating between relatively developing [6] and developed countries [7], based on average GDP per capita in Table 5.1. Students from relatively poorer countries, irrespective of their socioeconomic background, tend to perform worse than the overall average. This result was to be expected, given the existing literature and the correlation between education expenditure, GDP per capita, and academic performance at narrow level (Vicente et al., 2021). However, students from the poorer countries group tend to show better non-cognitive skills than the rest of the sample. In this case it is difficult to give a clear explanation, considering the lack of previous evidence and the fact that these variables are subjective, hence depending on the country context. Students may report being highly motivated compared to their peers, but this is influenced by the country context, so there are micro- and macro-effects that make the explanation difficult. In any case, the pattern between advantaged and disadvantaged students described above is the

[6]Relatively poor countries: Chile, Colombia, Greece, Hungary, Lithuania, Latvia, Mexico, Polonia, Portugal, Slovakia, and Turkey

[7]Relatively rich countries: Australia, Switzerland, Germany, Denmark, Finland, Iceland, Luxembourg, Netherlands, and United States

Table 5.1: Descriptive statistics

		All countries						Relatively poor countries						Relatively rich countries					
		All		Disad.		Advan.		All		Disad.		Advan.		All		Disad.		Advan.	
Variable	Description	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Student level																			
Gender	Female = 1	0.50	0.50	0.52	0.50	0.49	0.50	0.51	0.50	0.54	0.50	0.49	0.50	0.49	0.50	0.51	0.50	0.49	0.50
Immigrant status	First-gen = 1	0.04	0.19	0.05	0.23	0.03	0.16	0.01	0.8	0.01	0.09	0.01	0.08	0.06	0.24	0.09	0.28	0.05	0.21
Grade	Grade < modal= 1	0.14	0.35	0.21	0.41	0.10	0.29	0.20	0.40	0.27	0.45	0.15	0.36	0.09	0.30	0.14	0.35	0.05	0.22
ESCS	Socioeconomic index	-0.26	1.17	-1.51	0.85	0.83	0.49	-0.94	1.23	-2.3	0.75	0.36	0.61	0.15	0.99	-1.09	0.58	1.15	0.39
Pre-primary school	Attendance = 1	0.76	0.43	0.72	0.45	0.80	0.40	0.80	0.40	0.76	0.43	0.84	0.37	0.68	0.47	0.63	0.48	0.73	0.44
Age		15.8	0.29	15.82	0.29	15.81	0.29	15.82	0.29	15.82	0.29	15.81	0.29	15.83	0.29	15.83	0.29	15.83	0.29
Expectations	Occupational status index	67.30	18.83	62.98	20.98	71.68	15.88	79.77	17.10	67.85	19.09	73.75	14.69	66.12	19.14	61.83	21.42	70.81	16.01
Motivation	Ambition learning goals index	0.15	1.02	0.08	1.05	0.22	1.00	0.25	1.03	0.20	1.04	0.29	1.03	0.21	0.99	0.17	1.02	0.29	0.97
Mathematics	First plausible value	474.24	96.01	437.05	88.31	511.53	93.35	437.89	91.97	407.38	84.04	470.96	93.09	488.17	90.90	447.67	83.31	528.58	84.58
Reading	First plausible value	484.69	103.08	445.50	95.02	523.28	101.41	449.89	93.77	414.57	85.74	484.82	93.8	507.70	96.84	464.67	96.13	549.85	101.83
Science	First plausible value	483.46	97.29	445.78	88.63	520.51	96.04	447.62	88.10	416.94	79.84	480.68	89.27	505.70	96.84	463.78	87.96	546.06	93.22
School level																			
Public	Public school = 1	0.78	0.41	0.84	0.37	0.74	0.44	0.81	0.39	0.89	0.31	0.71	0.45	0.75	0.43	0.78	0.41	0.78	0.41
Private	Priv, Independent = 1	0.09	0.28	0.07	0.25	0.16	0.37	0.15	0.36	0.07	0.25	0.24	0.43	0.13	0.34	0.10	0.30	0.13	0.33
Private dep.	Priv. Government-depend.= 1	0.14	0.35	0.10	0.29	0.10	0.30	0.04	0.18	0.04	0.19	0.05	0.21	0.12	0.32	0.12	0.33	0.09	0.28
ESCS average	ESCS average in school	-0.77	1.14	-0.90	1.11	-0.35	0.83	-1.35	1.17	-1.63	1.00	-0.76	0.93	0.02	0.57	-0.02	0.54	0.06	0.54
School size	Number of students in school	467.6	517.8	485.03	526.85	562.29	548.95	366.85	481.02	380.55	495.54	483.3	546.06	591.79	627.79	601.83	631.57	636.14	638.93
City	Located in city $\geq$ 100k inhab.	0.30	0.46	0.27	0.44	0.39	0.49	0.29	0.46	0.24	0.42	0.44	0.50	0.32	0.47	0.30	0.46	0.33	0.47
Gender	Proportion of females	0.47	0.24	0.46	0.23	0.48	0.20	0.48	0.26	0.47	0.25	0.48	0.22	0.45	0.18	0.46	0.17	0.49	0.14
Student-teacher ratio	Nº Students / Nº teachers	15.6	10.7	15.98	10.73	15.27	10.68	18.43	12.91	19.28	13.04	18.18	13.94	13.06	5.97	13.19	6.05	13.45	5.97
Students	Number of students	188,218		54,073		66,102		60,333		16,719		21,888		45,103		13,671		15,176	
Schools	Number of schools	7,732		7,180		4,858		2,721		2,431		2,365		1,876		1,782		1,772	
Countries	Number of countries	29		29		29		11		11		11		9		9		9	

If a variable is equal to one in the description implies 0 otherwise. Disadvantaged students are those who are below the 33% percentile in the ESCS index and advantaged the ones who are above the 66% percentile in the same index (in both cases in country relative terms). Countries are classified as relatively poor if their GDP per capita is below the 33% percentile and relatively rich if their GDP per capita is above the 66% percentile
Source: OECD (PISA 2018) and own elaboration

same in both types of countries.

5.3.2 Methods

The methodology used to study the career guidance's effect on students' cognitive skills, motivation, and expectations is Propensity Score Matching (PSM). This is a quasi-experimental method that tries to simulate a randomization process, matching students with the same values of a propensity score, based on observable features, to try to find a causal effect of a treatment. The idea is to match individuals that are similar under a number of observable variables, with a difference in the treatment status. In this case, it is difficult to assume no differences in the non-observable characteristics among the matched individuals. Then, we cannot state that our results are causal, but at least they are the most robust results we could obtain with our observational data. We can identify three steps in this procedure. The first one is the creation of two groups, namely the treatment group and the control one, based on whether they have a career guidance counsellor employed at school or not. In the second step, we estimate a logit equation to obtain the linear propensity scores, as we can see in the left-hand side part of Equation 5.1, avoiding compression between 0 and 1 (Diamond & Sekhon, 2013). Once the scores are obtained, we match individuals with a non-exact matching for most of the variables, i.e. there are no significant differences between the matched individuals given a range. However, students are matched only within countries, to compare treated and untreated students living in a similar context. Thus, an exact matching for the

country of origin is done.

$$\log\left(\frac{p}{p-1}\right) = \beta_0 + \beta_1 X_{individual} + \beta_2 X_{school}, \tag{5.1}$$

where $X_{individual}$ represents all individuals covariates and X_{school} the school ones.

We match using nearest neighbor method with replacement,[8] matching the closest observations in terms of linear propensity scores between treated and untreated individuals. [9] We also use a caliper of 0.25 standard deviations as the maximum distance permitted, although results are robust using tighter calipers. Groups are balanced on the observable variables, having two theoretically similar groups differing only for having (treatment group) or not having (control group) a career guidance counsellor employed at school.

The third step is to measure the effect of the treatment variable (CG_{jk}) with the matched and balanced sample. In this case, we use a multilevel approach to control for the fact that students are nested in schools and these ones in countries. Therefore, we use a three-level model with random intercepts at both levels, as we can see in Equation 5.2.

$$Y_{ijk} = \beta_0 + \beta_1 CG_{jk} + \delta_k + \epsilon_{jk} + u_{ijk}, \tag{5.2}$$

where i=students, j=school and k=country.

[8]This implies that individuals can be used more than once reducing the possible bias (Caliendo & Kopeinig, 2008).

[9]Results are robust to the randomization of this process.

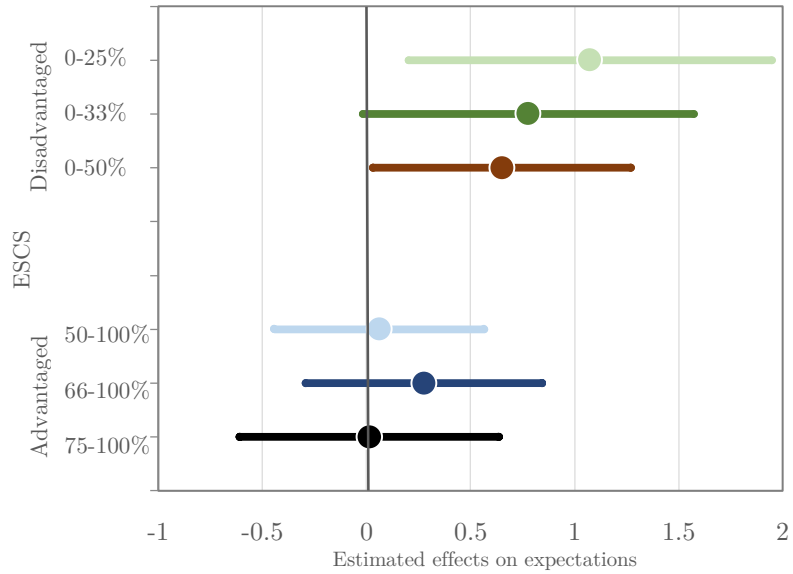
Notice that our treatment is at school level. Thus, the unique explanatory variable in Equation 5.2 is a dummy indicating if there is a career guidance counsellor employed at school (CG_{jk}) and its estimated effect (β_1) that depends on which dependent variable we are using (Y_{ijk}). Nonetheless, the specific procedure used here tends to match similar individuals attending similar schools with the only difference of having (or not) a formal guidance counsellor employed at their schools.

5.4 Results

5.4.1 Career guidance effect on expectations and motivation

First, we are going to analyse the effect of having a career guidance counsellor employed at school on student's expectations. In this case, the expectations are related to the labour market and the students' expected occupational status in the future measured with an ISEI index. To proceed with that analysis, as we can see in Figure 5.3 (and the same for all figures in this section) there are separate estimations splitting the sample depending on the relative percentile of the socioeconomic index (ESCS index). By 'relative' we mean that students have been classified in each percentile inside their own country. Thus, these students are classified as disadvantaged if they are below 25%, 33% or 50% percentile in the socioeconomic index inside their country and advantaged if they are above 50%, 66% or 75% percentile in the same index. For all estimations the line represents a 90% of confidence interval. Anyway, in Tables 5.2 and 5.3 (annex section) the estimations tables are available.

Figure 5.3: Career guidance effect on expectations by percentiles of the socioeconomic status (ESCS index). OECD countries. 2018.



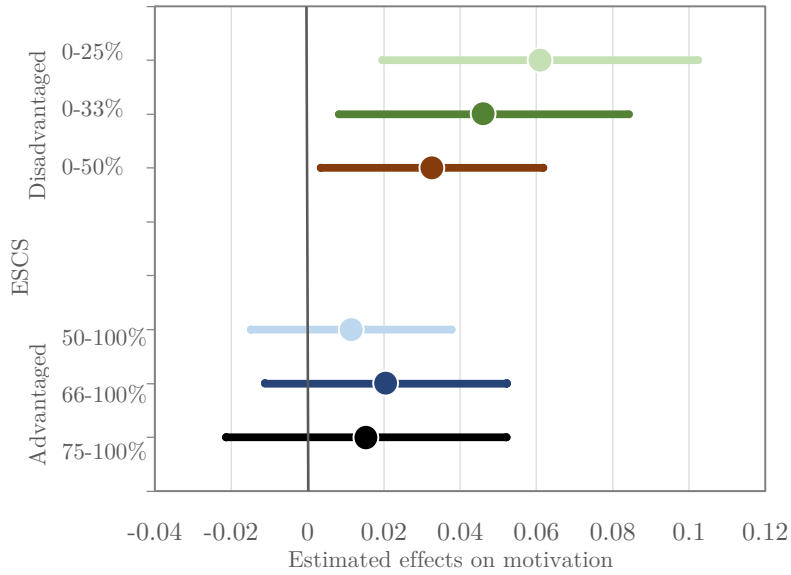
Lines represent a 90% of confidence interval
Source: OECD (PISA 2018) and own elaboration

In Figure 5.3 we can see a pattern in line with the mechanism. The effect of having a career guidance employed at school is significant only for the disadvantaged students; the effect gets larger as they are more and more disadvantaged, showing how heterogeneous it is. No statistically significant effect can be found for the most advantaged students, no matter how they are defined. This is the first time, to the best of our knowledge, that the heterogeneity of the career guidance's effect is estimated and disposed on the basis of empirical evidence.

Thanks to the information provided by the counsellors, disadvantaged students have better expectations about the future and this increases their motivation. This pattern is repeated in the motivation proxy variable (Figure 5.4). Having a career

guidance counsellor at school could positively affect the ambition to learn as much as possible, only for disadvantaged students, with this relationship being statistically significant. It is also positive and statistically significant for the whole sample, a result very similar to the study of Kashefpakdel, Mann and Schleicher (2016).

Figure 5.4: Career guidance effect on motivation by percentiles of the socioeconomic status (ESCS index). OECD countries. 2018.



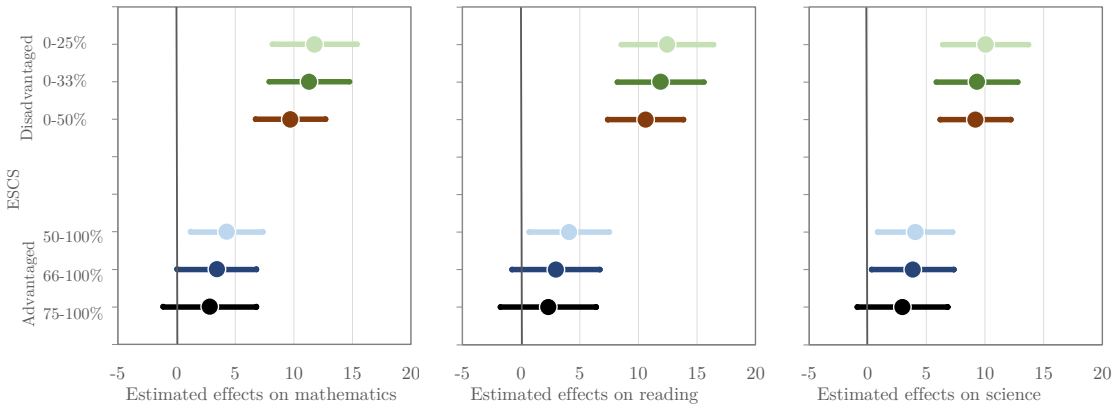
Lines represent a 90% of confidence interval
Source: OECD (PISA 2018) and own elaboration

5.4.2 Career guidance effect on cognitive skills

Given the mechanism proposed in Figure 5.1, the previous pattern of the career guidance relationship used for non-cognitive skills should be similar for cognitive skills. To study that, we proceed again with six estimations, one for each definition of socioeconomic disadvantaged or advantaged student in relation to their countries,

after the match with the multilevel second stage methodology. Figure 5.5 shows the career guidance relationship with mathematics test scores, but also with science and reading scores.

Figure 5.5: Career guidance effect on cognitive skills by percentiles of the socioeconomic status (ESCS index). OECD countries. 2018.



Lines represent a 90% of confidence interval
Source: OECD (PISA 2018) and own elaboration

Results reveals a positive and statistically significant effect of having a career guidance counsellor employed at school for the entire sample (Table 5.2), and mainly for the disadvantaged students (no matter how they are defined) on all cognitive skills. These effects are in line with those founded by Kashefpakdel and Schleicher (2017), although that study was applied to six selected countries without taking into account this heterogeneity (Kashefpakdel & Schleicher, 2017).

Regarding the heterogeneity, it seems clear that career guidance is increasingly important as the socioeconomic background is less privileged; in fact, no statistically significant effect can be found for the most advantaged students, i.e. those who are above the 66% percentile of the socioeconomic index, on all cognitive skills.

Bearing in mind that a career guidance counsellor does not have direct responsibility for the students' cognitive skills, how can it be related to better academic performance? As we argued previously, one of the main objectives of a career guidance counsellor is to provide information that improve the decision-making process (OECD, 2004), increasing student's expectations and motivation (Brisson et al., 2017; Hughes et al., 2016; Kashefpakdel & Schleicher, 2017). As disadvantaged students are worse informed (Musset & Kurekova, 2018) and with fewer expectations (Givord, 2020; Hughes et al., 2016; Watts, 2008), this could explain why career guidance can help disadvantaged students to succeed.

To sum up, our robust results show that the career counseling effect is heterogeneous depending on the students' socioeconomic background. Having a career guidance counsellor employed at school has positive effects especially on disadvantaged students, improving their expectations and motivation and positively affecting their educational performance. Taking into account that the starting point on all dependent variables is poorer, for the disadvantaged students, this indicates a process of convergence among the different socioeconomic statuses. This implies that career guidance helps to mitigate the inequality in education, with positive effects also for future professional and personal life.

Heterogeneity between countries

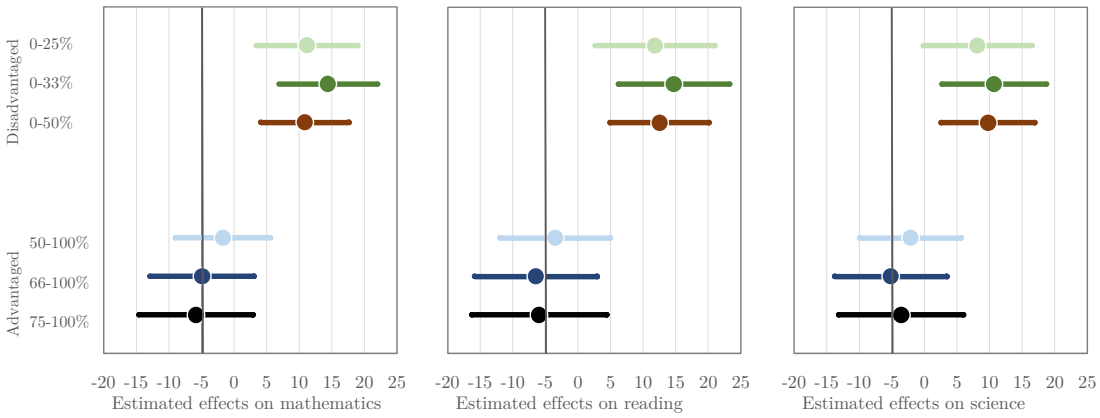
The above results could have important policy implications, as it provides guidelines for the design of policies to improve equality of opportunity within education.

Previous studies focused on this equality have shown that recommendations cannot be equally formulated for all countries, since the level of economic development plays an important role (Agasisti et al., 2017; OECD, 2013; Vicente et al., 2021). In these studies, countries have been classified given their GDP per capita or their expenditure in education, in order to recommend some policy guidelines in a more precise way. In this section we follow the same idea, classifying the countries in economically disadvantaged countries (if they are below the 33% percentile of the OECD GDP per capita) and economically advantaged countries (if they are above the 66% percentile of the OECD GDP per capita).

Figure 5.6 shows the relationship between having a career guidance counsellor employed at school and the academic performance in mathematics, reading, and science for the economically advantaged countries (see Table 5.4 for more information about the estimation). In this figure the pattern explained above, where the career guidance was significant just for the disadvantaged students, appears again. In previous studies the authors found no correlation between the policy proposed and the equality of opportunity in the richer countries, a different result from ours (Agasisti et al., 2017; OECD, 2013; Vicente et al., 2021).

Figure 5.7 illustrates how career guidance counselling seems important for students living in a less economically advantaged country, being statistically significant for all of them, even for the socioeconomically advantaged ones (see Table 5.5 for more information about the estimation). In addition, the effect appears stronger than the ones we represented in Figures 5.5 and 5.6, in line with the previous liter-

Figure 5.6: Career guidance effect on cognitive skills by percentiles of the socioeconomic status (ESCS index) for economically advantaged countries. OECD countries. 2018.



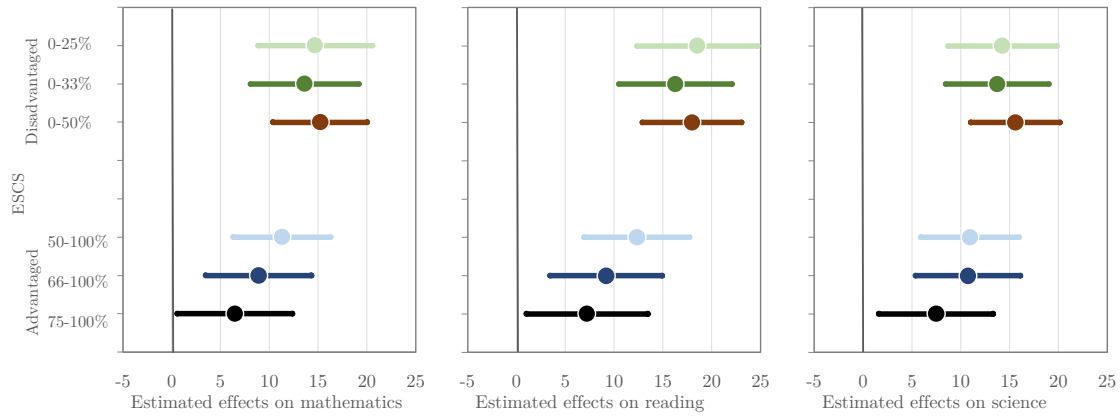
Lines represent a 90% of confidence interval
Source: OECD (PISA 2018) and own elaboration

ature working with equality of opportunity inside education (Agasisti et al., 2017; OECD, 2013; Vicente et al., 2021). This can be explained by the complex context and the difficulties to attain the information in these countries, but also because the incentives to study are different.

5.5 Sensitivity analysis

For this section we define two new treatment variables: one is more restricted, whereas the other one represents a wider definition of our previous treatment variable (having a career guidance counsellor employed at school). For the first one, we use the combination of the previous treatment variable with the variable that informs us whether the career guidance activities are scheduled into students' time at school or they are voluntary. Then, the treatment variable is equal to one when there

Figure 5.7: Career guidance effect on cognitive skills by percentiles of the socioeconomic status (ESCS index) for economically disadvantaged countries. OECD countries. 2018.

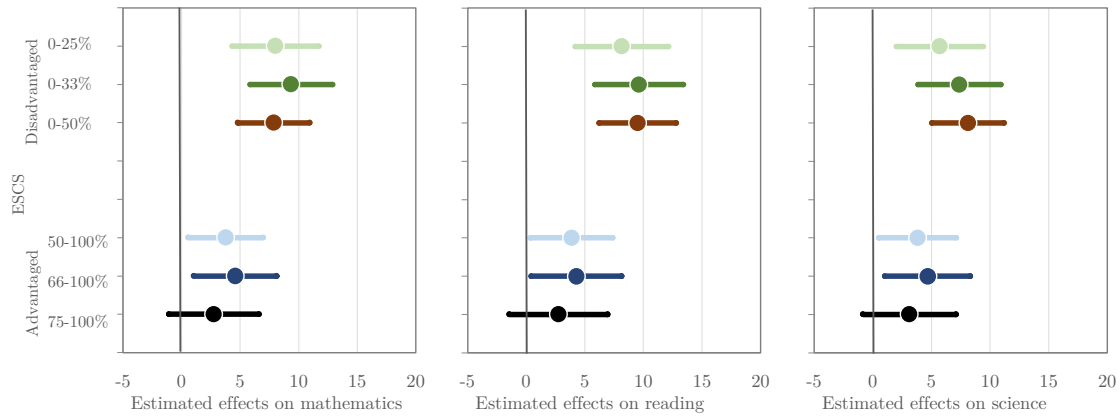


Lines represent a 90% of confidence interval
Source: OECD (PISA 2018) and own elaboration

is a career guidance counsellor employed at school and its guidance is compulsory for students. The robustness check is done to consider the fact that going for an interview with the career counsellor is not random and this could bias our results. In any case, the career guidance's tasks go beyond the interviews with some students, as they, for example, work directly with regular teachers at school.

The second new treatment variable refers to a general question, asked directly to the school principal, to know whether there is career guidance available at school. Thus, this variable could include a wide range of career guidance varieties, ranging from a school where all teachers have the responsibility for this guidance (no counsellor at all) to a school where there is a professional always at school providing this service. With this second robustness check, we want to give some insights into why we think our original treatment variable is the most reliable one and how career

Figure 5.8: Compulsory career guidance effect on cognitive skills by percentiles of the socioeconomic status (ESCS index). OECD countries. 2018.



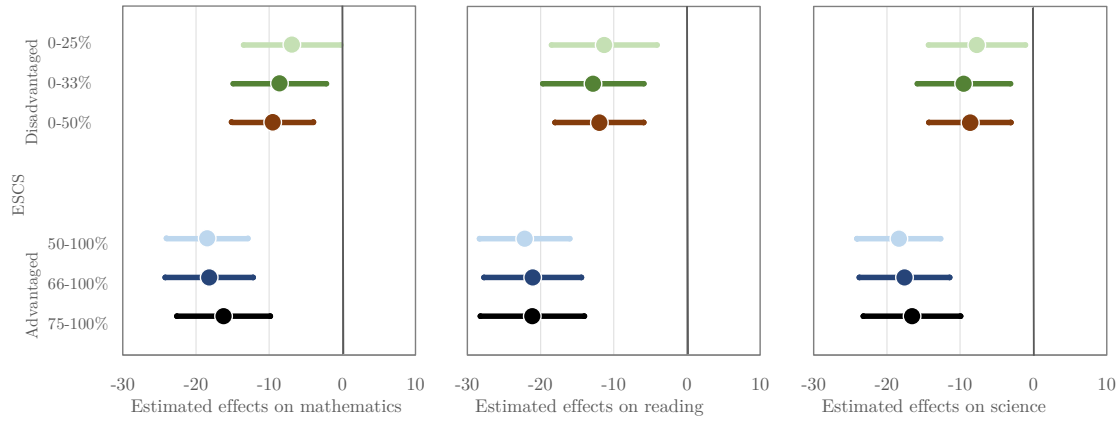
Lines represent a 90% of confidence interval
Source: OECD (PISA 2018) and own elaboration

guidance counselling should be provided, although this needs to be explored further in the future.

In both cases, the methodology applied is exactly the same as before, with the unique difference of the treatment. In Figure 5.8 we can see the relationship between the first new treatment variable (the more restricted one) and the cognitive skills (see Table 5.6 for more information about the estimation). The results, as we can see, are in line with the baseline analysis, with a similar pattern between students from different socioeconomic backgrounds. However, in this case the relationship seems less strong than before, which does not provide evidence that compulsory career guidance is an efficient policy, but future work could develop this line of research.

Following again the same methodology and structure, Figure 5.9 repeats the effect of the new second treatment variable, the general one, on cognitive skills (see Table 5.7 for more information about the estimation). The effect is totally different from

Figure 5.9: General career guidance effect on cognitive skills by percentiles of the socioeconomic status (ESCS index). OECD countries. 2018.



Lines represent a 90% of confidence interval
Source: OECD (PISA 2018) and own elaboration

the previous ones, since it appears negative for all, regardless of the socioeconomic background. This result goes against all the previous evidence, indicates that our original treatment variable is more reliable, and shows that the way in which career guidance is provided is also important.

5.6 Conclusions

In this paper we analyse the effect of having a career guidance counsellor employed at the school on cognitive skills, but also on the expectations and motivation, with a large (188,218 15 years old students) and international sample (29 countries), covering most OECD countries from OECD-PISA 2018. The main idea is to test whether this career guidance can be related to better equality of opportunities. Thus, we apply a novel heterogeneous analysis in terms of students' socioeconomic background,

taking also into account the differences between countries based on the income per capita. The applied methodology is a quasi-experimental one using a Propensity Score Matching procedure with a multilevel second stage. The findings presented in this study indicate that the lower the socioeconomic background, the greater the positive effect of the counsellor on helping students developing their cognitive skills. In fact, career counselling is not statistically significant for the most advantaged students. This result can be found in the economically advantaged OECD countries, but also in the poorer ones, where the effect is relevant for all students irrespective of their socioeconomic status. Then, we can conclude that career guidance could help to lessen inequalities in education. However, bearing in mind that counsellors do not teach mathematics or science, for example, there is another mechanism explaining this improvement. The socioeconomically disadvantaged students have less information than the most advantaged ones (Givord, 2020; Musset & Kurekova, 2018). If we consider that career guidance makes information easier to attain, these counsellors are more important for the former kind of students in terms of information. Therefore, the secondary inequalities (Erikson & Jonsson, 1996; Müller, 2014)related to the differences in the decision-making process among students from different backgrounds, are expected to decrease. With the provision of relevant information, students are more exposed to understanding their options, helping them to create achievable goals (Hughes et al., 2016; Kashefpakdel & Schleicher, 2017). This increases students' expectations, especially important for the disadvantaged ones. Our estimations also hold for the occupational status expectations, being the

career guidance more important for disadvantaged students. Thanks to this provision of information, students' intrinsic motivation also increases, as our results show, and again only for disadvantaged students.

Therefore, considering that the pattern is repeated in all the variables under study, the mechanism could be the following: providing information increases students' expectations and motivation, giving incentives to work harder and influencing their educational performance. Then, primary inequalities, related to the relationship between the socioeconomic background and the educational performance (Erikson & Jonsson, 1996; Müller, 2014), also decrease. With all this, we understand our results as a lower bound, given the data limitations, especially at school level.

Related to this lack of information, we cannot claim for causal relationships, but our results are strong enough and robust for policy suggestions. The provision of career guidance employing counsellors at schools is a public policy associated with a positive effect on educational outcomes and equality of opportunities, and not other types of career guidance provision, at least in this study. These outcomes can be related to the educational performance or achievement, but also with the transition to employment, skills to work and more (Hughes, 2010; Hughes et al., 2016; Musset & Kurekova, 2018). Bearing in mind that we compare having a counsellor employed at school with the rest of the sample and that there are many countries in our sample with more than 50% of schools without a career guidance counsellor employed at school, there is room for improvement in most the OECD countries. In any case, future studies could be more focused on which specific features of career guidance

are more important for reducing the inequality of opportunities.

In summary, there is strong evidence of a positive relationship between having a career guidance counsellor employed at school and better cognitive skills, but also with better expectations and motivation. However, this effect is heterogeneous, being relevant just for socioeconomically disadvantaged students. Therefore, one of the channels through which career guidance could reduce inequalities is by targeting the necessary information for this kind of students. Information increases their expectations and motivation, improving their educational performance. This could have a positive effect on the short run, but also on their future educational and labour outcomes.

5.7 Annex

Table 5.2: PSM multilevel second stage (students, schools and countries). Career guidance counsellor and cognitive skills.

Career guidance counsellor employed at school estimated effect									
	Mathematics			Reading			Science		
Regression by sample used	M.E.	P-value	N.Obs (stu/sch)	M.E.	P-value	N. Obs (stu/sch)	M.E.	P-value	N. Obs (stu/sch)
All sample	8.3	0.00	119,229/6,778	8.8	0.00	119,229/6,778	7.5	0.00	119,229/6,778
Disadvantaged (ESCS $\leq$ 25%)	11.8	0.00	27,290/5,433	12.5	0.00	27,290/5,433	10.0	0.00	27,290/5,433
Disadvantaged (ESCS $\leq$ 33%)	11.3	0.00	33,011/5,668	11.9	0.00	33,011/5,668	9.3	0.00	33,011/5,668
Disadvantaged (ESCS $\leq$ 50%)	9.7	0.00	56,883/6,261	10.6	0.00	56,883/6,261	9.2	0.00	56,883/6,261
Advantaged (ESCS $>$ 50%)	4.3	0.02	62,346/6,116	4.1	0.05	62,346/6,116	4.1	0.04	62,346/6,116
Advantaged (ESCS $\geq$ 66%)	3.4	0.09	42,981/5,689	3.0	0.19	42,981/5,689	3.8	0.07	42,981/5,689
Advantaged (ESCS $\geq$ 75%)	2.8	0.20	32,005/5,265	2.3	0.35	32,005/5,265	3.0	0.21	32,005/5,265

Source: OECD (PISA 2018) and own elaboration. Students are socioeconomically classified according to the percentile of their country using the ESCS index. In all cases the number of countries is 29 (third level).

Table 5.3: PSM multilevel second stage (students, schools and countries). Career guidance counsellor, expectations and motivation.

Career guidance counsellor estimated effect						
	Expectations			Motivation		
Regression by sample used	M.E.	P-value	N.Obs (stu/sch)	M.E.	P-value	N. Obs (stu/sch)
All sample	0.4	0.11	94,712/6,550	0.02	0.05	111,532/6,644
Disadvantaged (ESCS $\leq$ 25%)	1.1	0.04	21,161/5,009	0.06	0.02	24,888/5,249
Disadvantaged (ESCS $\leq$ 33%)	0.78	0.11	25,676/5,272	0.05	0.05	30,174/5,484
Disadvantaged (ESCS $\leq$ 50%)	0.65	0.08	44,4179/5,947	0.03	0.06	52,475/6,106
Advantaged (ESCS $>$ 50%)	0.06	0.84	49,993/5,870	0.01	0.47	59,057/5,995
Advantaged (ESCS $\geq$ 66%)	0.28	0.42	34,493/5,389	0.02	0.29	40,842/5,561
Advantaged (ESCS $\geq$ 75%)	0.01	0.97	25,728/4,932	0.02	0.70	30,431/5,138

Source: OECD (PISA 2018) and own elaboration. Students are socioeconomically classified according to the percentile of their country using the ESCS index. In all cases the number of countries is 29 (third level).

Table 5.4: PSM multilevel second stage (students, schools and countries). Career guidance effect on cognitive skills by percentiles of the socioeconomic status (ESCS index) for economically disadvantaged countries. 2018

Career guidance counsellor employed at school estimated effect									
	Mathematics			Reading			Science		
Regression by sample used	M.E.	P-value	N.Obs (stu/sch/cntr)	M.E.	P-value	N. Obs (stu/sch/cntr)	M.E.	P-value	N. Obs (stu/sch/cntr)
All sample	17.65	0.00	35,169/2,290/11	19.34	0.00	35,169/2,290/11	18.87	0.00	35,169/2,290/11
Disadvantaged (ESCS $\leq$ 25%)	14.69	0.00	7,091/1,800/11	18.51	0.00	7,091/1,800/11	14.26	0.00	7,091/1,800/11
Disadvantaged (ESCS $\leq$ 33%)	13.62	0.00	8,708/1,876/11	16.28	0.00	8,708/1,876/11	13.73	0.00	8,708/1,876/11
Disadvantaged (ESCS $\leq$ 50%)	15.22	0.00	15,961/2,095/11	17.99	0.00	15,691/2,095/11	15.60	0.00	15,691/2,095/11
Advantaged (ESCS $>$ 50%)	11.31	0.00	19,478/2,055/11	12.36	0.00	19,478/2,055/11	10.96	0.00	19,478/2,055/11
Advantaged (ESCS $\geq$ 66%)	8.90	0.01	13,706/1,897/11	9.20	0.00	13,706/1,897/11	10.74	0.00	13,706/1,897/11
Advantaged (ESCS $\geq$ 75%)	6.48	0.07	10,314/1,719/11	7.24	0.06	10,314/1,719/11	7.47	0.04	10,314/1,719/11

Source: OECD (PISA 2018) and own elaboration. Students are socioeconomically classified according to the percentile of their country using the ESCS index.

Table 5.5: PSM multilevel second stage (students, schools and countries). Career guidance effect on cognitive skills by percentiles of the socioeconomic status (ESCS index) for economically advantaged countries. 2018

Career guidance counsellor employed at school estimated effect									
	Mathematics			Reading			Science		
Regression by sample used	M.E.	P-value	N.Obs (stu/sch/cntr)	M.E.	P-value	N. Obs (stu/sch/cntr)	M.E.	P-value	N. Obs (stu/sch/cntr)
All sample	4.60	0.23	29,972/1,777/9	4.72	0.27	29,972/1,777/9	3.74	0.36	29,972/1,777/9
Disadvantaged (ESCS $\leq$ 25%)	11.16	0.02	7,426/1,800/9	11.83	0.03	7,426/1,800/9	8.15	0.11	7,426/1,800/9
Disadvantaged (ESCS $\leq$ 33%)	14.43	0.00	8,939/1,511/9	14.72	0.00	8,939/1,511/9	10.67	0.03	8,939/1,511/9
Disadvantaged (ESCS $\leq$ 50%)	10.89	0.01	15,009/1,657/9	12.54	0.01	15,009/1,657/9	9.76	0.03	15,009/1,657/9
Advantaged (ESCS $>$ 50%)	-1.68	0.70	14,963/1,612/9	-3.47	0.50	14,963/1,612/9	-2.10	0.66	14,963/1,612/9
Advantaged (ESCS $\geq$ 66%)	-4.91	0.31	10,149/1,509/9	-6.43	0.26	10,149/1,509/9	-5.15	0.33	10,149/1,509/9
Advantaged (ESCS $\geq$ 75%)	-5.82	0.27	7,435/1,398/9	-5.93	0.35	7,435/1,398/9	-3.56	0.54	7,435/1,398/9

Source: OECD (PISA 2018) and own elaboration. Students are socioeconomically classified according to the percentile of their country using the ESCS index.

Table 5.6: PSM multilevel second stage (students, schools and countries). Compulsory career guidance effect on cognitive skills by percentiles of the socioeconomic status (ESCS index). 2018

Compulsory career guidance at school estimated effect									
	Mathematics			Reading			Science		
Regression by sample used	M.E.	P-value	N.Obs (stu/sch/cntr)	M.E.	P-value	N. Obs (stu/sch/cntr)	M.E.	P-value	N. Obs (stu/sch/cntr)
All sample	6.70	0.00	97,645/6,012/29	19.34	0.00	97,645/6,012/29	18.87	0.00	97,645/6,012/29
Disadvantaged (ESCS $\leq$ 25%)	8.03	0.00	22,883/4,701/28	18.51	0.00	22,883/4,701/28	14.26	0.00	22,883/4,701/28
Disadvantaged (ESCS $\leq$ 33%)	9.36	0.00	27,592/4,916/28	16.28	0.00	27,592/4,916/28	13.73	0.00	27,592/4,916/28
Disadvantaged (ESCS $\leq$ 50%)	7.88	0.00	47,134/5,470/28	17.99	0.00	47,134/5,470/28	15.60	0.00	47,134/5,470/28
Advantaged (ESCS $>$ 50%)	3.78	0.05	50,511/5,381/29	12.36	0.00	50,511/5,381/29	10.96	0.00	50,511/5,381/29
Advantaged (ESCS $\geq$ 66%)	4.60	0.03	34,698/4,933/29	9.20	0.00	34,698/4,933/29	10.74	0.00	34,698/4,933/29
Advantaged (ESCS $\geq$ 75%)	2.77	0.24	25,861/4,531/29	7.24	0.06	25,861/4,531/29	7.47	0.04	25,861/4,531/29

Source: OECD (PISA 2018) and own elaboration. Students are socioeconomically classified according to the percentile of their country using the ESCS index.

Table 5.7: PSM multilevel second stage (students, schools and countries). General career guidance effect on cognitive skills by percentiles of the socioeconomic status (ESCS index)

General career guidance available at school estimated effect									
	Mathematics			Reading			Science		
Regression by sample used	M.E.	P-value	N.Obs (stu/sch/cntr)	M.E.	P-value	N. Obs (stu/sch/cntr)	M.E.	P-value	N. Obs (stu/sch/cntr)
All sample	-17.43	0.00	149,401/6641/24	-20.88	0.00	149,401/6641/24	-16.80	0.00	149,401/6641/24
Disadvantaged (ESCS $\leq$ 25%)	-6.86	0.09	35,153/5,877/24	-11.31	0.01	35,153/5,877/24	-7.70	0.06	335,153/5,877/24
Disadvantaged (ESCS $\leq$ 33%)	-8.60	0.03	42,412/6,033/24	-12.81	0.00	42,412/6,033/24	-9.53	0.01	42,412/6,033/24
Disadvantaged (ESCS $\leq$ 50%)	-9.52	0.01	72,592/6,399/24	-11.95	0.00	72,592/6,399/24	-8.65	0.01	72,592/6,399/24
Advantaged (ESCS $>$ 50%)	-18.45	0.00	76,809/6,254/24	-22.15	0.00	76,809/6,254/24	-18.37	0.00	76,809/6,254/24
Advantaged (ESCS $\geq$ 66%)	-18.18	0.00	52,593/5,955/24	-21.04	0.00	52,593/5,955/24	-17.61	0.00	52,593/5,955/24
Advantaged (ESCS $\geq$ 75%)	-16.21	0.00	38,949/5,623/24	-21.07	0.00	38,949/5,623/24	-16.58	0.00	38,949/5,623/24

Source: OECD (PISA 2018) and own elaboration. Students are socioeconomically classified according to the percentile of their country using the ESCS index.

Chapter 6

Conclusions

Education can be understood as the main tool available to governments, states, and policy makers to increase social mobility by making the "social elevator" work (Ermisch & Francesconi, 2001b; OECD, 2018a). This is especially important for upward social mobility, i.e. the promotion of individuals to higher social standings than their parents (OECD, 2018a). The main reason for this is that education can reduce the negative influence of students' socioeconomic background on their future standard of living in the case of the socioeconomically disadvantaged students. Thus, if there is no equality of opportunities inside the education system, only the most socioeconomically advantaged students could truly benefit from their education, so the education system might not only fail to decrease inequality, but it might even increase it. This could lead to a country in which it is easy to predict the socioeconomic status of children on the basis of parental information, i.e. where there is no equality of opportunity, to assume social and economic costs, in addition

to the ethical ones.

This Doctoral Thesis has studied the equality of opportunities inside the education system, providing empirical evidence and some policy guidelines for improving it. Literature is somewhat scarce compared to other topics, such as the determinants of educational performance, and there is no clear consensus on how to address the concept of inequality. In this case, the main approach to assess the educational equality are the resilient students, i.e. those students that managed to overcome their adversities given their relatively low socioeconomic status. Thus, an education system has better equality of opportunity for its students a higher proportion of resilient students exists, and a policy is effective for reducing educational inequality if it makes it easier for socioeconomically disadvantaged students to be resilient. This concept of "resilience", as it is used in this Doctoral Thesis and in the economics of education literature, has been the subject of some previous scientific publications, validating its use as a proxy variable for educational inequality.

The three main chapters of this Doctoral Thesis were the third to the fifth. The first of these three chapters has analysed the resilience determinants, using a new and more sophisticated technique, a multilevel one with random slope and intercept, to define who was resilient, proving some public policy recommendations. This chapter has shown how the determinants of equality of opportunity can vary from country to country, making it necessary to differentiate between them. The sample was the set of 15 years old students present in the Programme for International Student Assessment surveys, also known as PISA, between 2000 and 2018 for the OECD

countries. In this case, countries were grouped according to their per capita income, and it was found that public spending in education was only significant for countries with fewer resources. Moreover, using some simulations, this chapter has found that there is a spending ceiling, beyond which spending more was not related to a greater likelihood of being resilient, i.e. to better equality of opportunity. Countries with more resources, the relatively richer ones, on the other hand, should focus on how to spend, as on average they have already exceeded that spending ceiling, and this could imply, for example, prioritising teachers' salaries.

There are no doubts about the positive effect of education in the long run, when students become adults, but less is known about the effect of having been resilient. Is it enough for socioeconomically disadvantaged students to turn resilient in order to achieve the same living conditions as the most advantaged ones in adulthood? Chapter four has answered this question, among others, trying to go one step further from the previous chapter, and from the rest resilience literature, using the EU-28 sample between 2005 and 2019 inside the European Union Statistics of Income and Living Conditions (EU-SILC) database. The main objective of this chapter was to compare individuals who were resilient students with those who were socioeconomically advantaged students in terms of hourly wages. This was done to analyse how education can reduce or eliminate differences between students from different socioeconomic backgrounds, because to be classified as resilient the first necessary condition is to be socioeconomically disadvantaged. Results, using hybrid multilevel models, have shown that, once all observable variables like activity sector or education are con-

trolled, there is a difference of more than 5% in favour of the advantaged individuals. In fact, these differences appear only when education is controlled, showing that it is obviously useful for improving disadvantaged students' futures, but it is not perfect for reducing socioeconomic inequalities. This difference was called during the chapter "glass ceiling", and it can be explained by the differences in information, contacts, or kind of skills more reachable in a house with high human capital.

The other question addressed in this chapter was the difference between disadvantaged students who managed to be resilient with those ones who did not. The idea was to study if the expected differences in hourly wages, given the higher educational level attained by resilients, can be attributed to something more than education. Resilients are individuals who have demonstrated skills and attributes that make them overcome adversities, so they are expected to have higher soft skills, like capacity to work or motivation. However, results showed that there is no difference once the effect of education is eliminated in hourly wages. This does not mean that resilients do not have any specific skills or that those skills are not valued in labour market, because they could facilitate a higher employment quality or greater job stability, among other examples, which go beyond the scope of the chapter. Moreover, the effect of being resilient could be absorbed by the rest of the explanatory variables, since the behaviour of resilients students could be correlated with variables such as activity sector or occupational level.

Back to the difference between individuals from different socioeconomic backgrounds, one of the main reasons for the inequality is indeed the inequality in in-

formation. Students from families where both parents attended university value education differently than students where neither parent has a university degree, which could translate into different educational and performance behaviours. In fact, students with similar academic performance, but with different socioeconomic backgrounds, tend to take different decisions. One good example is the mismatch between educational performance and future expectations, which is more common in disadvantaged students. Therefore, in order to strive for greater equality of opportunity, it becomes imperative to diminish information inequality, and this is precisely the focal point of chapter five.

Chapter five studied the effect of a public policy based on the provision of information, considering students' socioeconomic heterogeneity. The policy studied was the provision of career guidance in school for 15 years old students from the OECD countries participating in PISA 2018. First, an expected mechanism was proposed: providing information to students could make them more conscientious about how important education is, which could make them more motivated and therefore improve their academic performance. However, as it was argued previously, not all students have the same level of information available and this is related to their socioeconomic background of origin, so the effect of this policy may be heterogeneous depending on the socioeconomic background. This is closely related to the previous chapters, although in this one the resilience concept is not used, since if providing information can be associated with higher academic performance for disadvantaged students implies that they could find it easier to become resilient, i.e.

to overcome adversities and reduce the impact of their socioeconomic background, the main objective of the all public policies developed in this Doctoral Thesis.

Using a quasi-experimental approach, chapter five found a heterogeneous relationship between the provision of a career guidance counsellor at school and the variables of interest. These variables were intrinsic motivation, expectations about the future and academic performance. Providing career guidance in school was related to higher students' intrinsic motivation and expectations about the future, although only for socioeconomically disadvantaged ones. Moreover, this provision also had a strong relationship with academic performance in mathematics, science and reading, and again only for disadvantaged students. Therefore, the mechanism proposed seemed to be confirmed, because if career guidance counsellors do not teach mathematics or science, why did disadvantaged students who had a guidance counsellor in school seem to have better academic performance than the one without it? Because they tended to have higher expectations and intrinsic motivation, characteristics previously related in the literature to higher academic performance.

On the other hand, chapter five also provided a heterogeneous analysis based on countries' characteristics, following what was done in chapter three, so two groups of countries were created depending on their income per capita. Results were again different between the two groups of countries. For the economically disadvantaged countries the provision of career guidance was important for all kinds of students, independently of their socioeconomic status while for economically advantaged countries, the pattern was the same as before. The differential pattern in the economically

disadvantaged countries could be explained by the values associated to education or even for a lack of educational information also in the most socioeconomically advantaged families. In any case, although the effect may not be the same, the policy recommendations could be exactly the same.

All in all, being born into a particular socioeconomic context is a totally random act, but one that can be a determining factor throughout one's life. As it has seen in the three main chapters, the socioeconomic background has a significant impact both inside and outside the education system and from very heterogeneous ways: from the lack of resources to the inequality of information. Bearing in mind that, as mentioned above, the main educational inequality is currently to be found in the educational performance or attainment, and not so much in the access to education, countries, and policy makers need to place greater emphasis on the equality of opportunity within the education system itself, for economic and social justice reasons. So far, however, the focus has been more on overall academic performance from both the media and academia, when education should be about two objectives, excellence and equality. This Doctoral Thesis aimed to provide further evidence and public policy recommendations in search of equality in education, one of the major objectives that any education system should have. To this end, resilient students were used and relatively complex methodologies were applied, as they help to rigorously assess, through the use of data, the level of educational inequality. The main results showed that education still has room for improvement in promoting equality of opportunities given the influence of the socioeconomic status during the educational stage and even

beyond, i.e. the influence of being born into a family with a certain socioeconomic status. There are some useful mechanisms and policies to reduce this influence, some of them have been studied in this Doctoral Thesis, although the different realities of each country and society must always be taken into account.

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