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Working Paper

The great separation: Top earner segregation at work in high-income countries

MaxPo Discussion Paper, No. 20/3

Provided in Cooperation with:

Max Planck Sciences Po Center on Coping with Instability in Market Societies (MaxPo)

Suggested Citation: Godechot, Olivier et al. (2020) : The great separation: Top earner segregation at work in high-income countries, MaxPo Discussion Paper, No. 20/3, Max Planck Sciences Po Center on Coping with Instability in Market Societies (MaxPo), Paris

This Version is available at:

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No. 20/3

maxpo discussion paper

The Great Separation

Top Earner Segregation at Work in High-Income Countries

Olivier Godechot, Paula Apascaritei, István Boza, Lasse Henriksen, Are Skeie Hermansen, Feng Hou, Naomi Kodama, Alena Křížková, Jiwook Jung, Marta Elvira, Silvia Maja Melzer, Eunmi Mun, Halil Sabanci, Max Thaning, Nina Bandelj, Alexis Baudour, Dustin Avent-Holt, Aleksandra Kanjuo-Mrčela, Zoltán Lippényi, Andrew Penner, Trond Petersen, Andreja Poje, William Rainey, Mirna Safi, Matthew Soener, and Donald Tomaskovic-Devey

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Max Planck Sciences Po Center on Coping with Instability in Market Societies

June 2020

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How to cite this paper

Olivier Godechot, Paula Apascaritei, István Boza, Lasse Henriksen, Are Skeie Hermansen, Feng Hou, Naomi Kodama, Alena Křížková, Jiwook Jung, Marta Elvira, Silvia Maja Melzer, Eunmi Mun, Halil Sabanci, Max Thaning, Nina Bandelj, Alexis Baudour, Dustin Avent-Holt, Aleksandra Kanjuro-Mrčela, Zoltán Lippényi, Andrew Penner, Trond Petersen, Andreja Poje, William Rainey, Mirna Safi, Matthew Soener, and Donald Tomaskovic-Devey. 2020. "The Great Separation: Top Earner Segregation at Work in High-Income Countries." *MaxPo Discussion Paper 20/3*. Max Planck Sciences Po Center on Coping with Instability in Market Societies, Paris.

MaxPo Discussion Paper

ISSN 2196-6508 (Print)

ISSN 2197-3075 (Internet)

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Abstract

Analyzing linked employer-employee panel administrative databases, we study the evolving isolation of higher earners from other employees in eleven countries: Canada, Czechia, Denmark, France, Germany, Hungary, Japan, Norway, Spain, South Korea, and Sweden. We find in almost all countries a growing workplace isolation of top earners and dramatically declining exposure of top earners to bottom earners. We compare these trends to segregation based on occupational class, education, age, gender, and nativity, finding that the rise in top earner isolation is much more dramatic and general across countries. We find that residential segregation is also growing, although more slowly than segregation at work, with top earners and bottom earners increasingly living in different distinct municipalities. While work and residential segregation are correlated, statistical modeling suggests that the primary causal effect is from work to residential segregation. These findings open up a future research program on the causes and consequences of top earner segregation.

Keywords: work, earnings, segregation, inequality, elite

Résumé

En nous appuyant sur des données administratives longitudinales employeur-employés, nous analysons l'évolution de la ségrégation sociale des salariés à hauts salaires dans onze pays: Allemagne, Canada, Corée du Sud, Danemark, Espagne, France, Hongrie, Japon, Norvège, République tchèque et Suède. Nous constatons dans presque tous les pays une forte augmentation de l'entre soi des salariés bien payés sur le lieu de travail et une diminution spectaculaire de leur exposition aux bas salaires. Nous comparons ces tendances à l'évolution de la ségrégation fondée sur la catégorie sociale, l'éducation, l'âge, le sexe et le statut migratoire, et nous constatons que l'augmentation de l'entre soi des hauts salaires est celle qui est la plus prononcée et la plus générale. Nous montrons que la ségrégation résidentielle se développe aussi, bien que plus lentement que la ségrégation au travail, avec les hauts et les bas salaires vivant de plus en plus dans des municipalités distinctes. Ségrégation au travail et ségrégation résidentielle sont corrélées. Mais nos modèles statistiques suggèrent aussi que la principale relation de causalité va de la ségrégation au travail vers la ségrégation résidentielle. Ces résultats ouvrent la voie à un futur programme de recherche sur les causes et les conséquences de la ségrégation des hauts salaires.

Mots-clés: travail, salaire, ségrégation, inégalité, élite

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The Great Separation: Top Earner Segregation at Work in High-Income Countries

1 Introduction

The sharing of the pie is a common metaphor for approaching inequality. Some get the lion's share. Others get the mouse's share. This representation of inequality is well explored in the now flourishing literature on wage, income, and wealth inequality (Piketty 2014; Alvaredo et al. 2018). If we shift the lens from the object that is shared (the pie) to the people sharing it at the same table, this metaphor becomes relevant to another dimension of inequality: segregation. Imagine two societies with the same level of income inequality but where the level of social mixing contrasts sharply. The two societies would be radically different, with different patterns of interactions and different cognitive representations of elites and masses.

As for income inequality, assessing the magnitude and evolution of segregation is all the more important as it also impacts social cohesion. According to the classic contact hypothesis (Allport 1954; Pettigrew et al. 2011), having more contacts between various groups decreases prejudice and enables the humanization of others. Conflicts of coexistence between groups (Blumer 1958; Chamboredon and Lemaire 1970; Enos 2014) are unlikely to occur when the underlying conditions of the contact hypothesis, such as the existence of real interactions, similarity of status, bilateral dependence, and the existence of a positive mixing norm (Amir 1994; Dinesen and Sønderskov 2015; Moody 2001; Janssen et al. 2019), are met.

In addition to its impact on mutual recognition, social mixing also has a redistributive impact. Amenities and nuisances are unequally distributed, the former being more concentrated at the top of the social structure, the latter at the bottom, and they tend to flow in society through social proximity. Hence, short paths to privileged people holding key resources, notably social, cultural, or symbolic capital, enable multiple channels of

We would like to thank Gilles Bastin, Steffen Brenner, Bruno Cardon, Bruno Cousin, Jean Finez, Emiliano Grossman, Emeric Henry, Alex Janus, Alexander Kentikelenis, Tali Kristal, Michèle Lamont, Patrick Le Galès, Patrick Le Bihan, Donald MacKenzie, Bruno Palier, Thomas Piketty, Thomas Reverdy, Allison Rovny, Claudia Senik, Pascale Trompette, Josh Whitford, and Myungji Yang for useful comments on earlier versions of this paper.

The research and writing of this paper benefited from the monetary support of the following institutions: Agence Nationale de la Recherche (grant ANR-17-CE41-0009-01), Alexander von Humboldt-Stiftung (grant AR8227), Det Frie Forskningsråd (grant 5052-00143b), Forskningsrådet om Hälsa, Arbetsliv och Välfärd (grant 2015-00807), European Social Fund and state budget of the Czech Republic (grant CZ.03.1.51/0.0/0.0/15_009/0003702), Rozvoj Výzkumné Organizace (RVO:68378025), Puig Chair of Global Leadership Development, Norges Forskningsråd (grant 287016), and the US National Science Foundation (grant SES-1528294).

redistribution (Lin 2002). For instance, social capital is critical for providing information on job opportunities; this information flows through contacts from the top to the bottom of the social hierarchy (Lin, Ensel, and Vaughn 1981). Similarly, as shown by an extensive body of research on “peer effects,” accumulation and use of human capital have positive spillovers on the proximate social environment (Sacerdote 2011). In addition, social groups produce through their mere existence ecological externalities in terms of health, crime, etc. Hence, a classical reason for the upper classes to socially segregate is to avoid the perceived dangers associated with the lower classes (Chevalier 1958; Paugam et al. 2017). Therefore, social mixing may have contrasting distributional consequences, positive for the lower classes and negative for the upper classes, thus fueling a tendency for the latter to self-segregate from the former.

While social segregation deeply impacts societies through a decline in social cohesion and in the redistribution of amenities from top to bottom, we lack long-term research analyzing its evolution in various spheres of daily life. Classical analysis of segregation, especially in the United States, focused mainly on racial segregation in neighborhoods and in schools (Massey and Denton 1993; Rugh and Massey 2014; Reardon and Yun 2001; Fiel 2013). In recent work, the socioeconomic dimension of residential segregation has become an object of analysis (Préteceille 2006; Reardon and Bischoff 2011; Quillian 2012; Godechot 2013; Tammaru et al. 2015; Scarpa 2015; Owens 2016).

Neighborhoods, however, are not the only or even the main source of social interaction during adult life. On average, in modern market societies, workers spend more time at work interacting with coworkers than in their neighborhood interacting with neighbors (Héran 1988; Blanpain and Pan Ké Shon 1998). Gender and ethnic segregation at work are the object of ongoing research (Reskin 1993; Tomaskovic-Devey et al. 2006; Baunach 2002; Hellerstein and Neumark 2008), but little is known about the segregation of workers along the income dimension. Two recent studies decomposing the variance of wages pinpoint the role of increased sorting of workers between firms in fueling the growth in inequality and suggest that increased earnings segregation between firms is one of its key channels (Card, Heining, and Kline 2013; Song et al. 2019). However, these two studies are each limited to one country (West Germany and the United States), and their single and abstract measure of segregation based on wage variance does not begin to address the heterogeneity of the phenomenon.

In this paper, we tackle this heterogeneity and analyze more precisely “who works with whom” in the earnings hierarchy in eleven developed countries across a variety of institutional settings (Esping-Andersen 1990; Hall and Soskice 2001). Thanks to our large-scale collaboration with access to linked employer-employee panel data, we can measure segregation in one “liberal” Northern American economy (Canada), three Scandinavian “social-democratic” economies (Denmark, Norway, Sweden), three “corporatist” western European economies (France, Germany, Spain), two “transitioning” economies (Czechia, Hungary), and two Asian export-oriented economies (Japan and South Korea).

In order to document the levels and evolutions of propinquity between various groups of earners over the last twenty years, we use standardized measures of exposure based on earnings fractiles. Because it is based on ranks rather than on nominal wage value, this approach disentangles the evolution of segregation from that of wage inequality. It allows us, first, to study in great detail the patterns and heterogeneity of earnings segregation at work; second, to compare the direction and pace of those trends between countries; third, to contrast these trends with other forms of segregation (notably gender and nativity segregation); and fourth, to address its link with residential segregation.

We show a dramatic and robust increase in the isolation of top earners at work, one that is much more pronounced than the evolution of other forms of social segregation. We also show that this process of work segregation is correlated with changes in residential segregation and provide evidence that the former contributes to the latter. This enables us to see segregation not only as the result of avoidance strategies among the upper classes but also as a structural phenomenon due to the reconfiguration of economic activity.

The paper is organized as follows. We begin in the first and second sections by linking our contribution to previous literature and detailing the data and measures we use. In the third section, we establish our main result, an increase in wage segregation at work, before going on in sections four and five to verify the robustness of this trend to alternative specification and compare earnings segregation with other forms of workplace segregation. In the sixth and final sections, we assess the relationship between workplace and residential segregation and conclude by discussing a research program for exploring further the sources and consequences of top earner segregation.

2 From ethnic residential segregation to earnings segregation at work

The probability of top and bottom earners to work in the same workplace has hitherto been studied in two research areas: social segregation and decomposition of wage variance.

The present study aims to uncover the same kind of segregation at work that has been studied mainly at the residential level. The types of groups mostly studied are ethno-racial and migratory ones, especially in the context of the segregation of African Americans in the United States as a legacy of slavery and apartheid (Massey and Denton 1993). Despite some decline in the last forty years, black-white segregation remains high in the United States, and Hispanic-white segregation has increased (Rugh and Massey 2014). Although less dramatic than in the US, ethnic or migrant segregation is also pronounced in Europe (Musterd 2005), where it evolves in contrasting directions (Pan Ké Shon and Verdugo 2015; Malmberg et al. 2018).

Recently, the evolution of socioeconomic residential segregation (measured either by income, occupations, or education) has received more attention. Reardon and Bischoff (2011), for the United States, and Prêteceille (2006) and Godechot (2013), for France, documented an increase over the previous twenty years, notably in the degree of segregation of top earners. Moreover, Quillian and Lagrange (2016) find that in the largest cities in both the US and France the highest earners are the most segregated. And even more generally, Tammaru et al. (2015) and Musterd et al. (2017) find that residential segregation between the rich (defined variously as top income quintile, top occupations, or high level of education) and the poor is rising in thirteen major European cities.

Transferring the concepts of segregation to the workplace level led mainly to an exploration of gender and ethnicity (Reskin 1993; Tomaskovic-Devey et al. 2006; Baunach 2002; Hellerstein and Neumark 2008; Bygren 2013). Previous research shows, for instance, a U-shape pattern in the evolution of ethnic segregation at work in the United States (Ferguson and Koning 2018) and an increasing ethnic segregation in Sweden during the 1985–2002 period (Åslund and Skans 2010). The socioeconomic dimension of segregation at work was first approached through the study of “sorting” by levels of education. Some studies provide evidence of growing segregation at work by levels of skill (Kremer and Maskin 1996). However, it is often considered a functional, if not natural, source of sorting that needs to be accounted for in order to study ethnic and gender segregation, but it is not much studied for itself.

While earnings segregation at work per se is an underdeveloped topic, this phenomenon is linked to a stream of recent research in economics: the evolution of wage variance between and within establishments. Papers by Card, Heining, and Kline (2013) for West Germany and Song et al. (2019) for the United States show that the growth in inequality in both countries occurred mainly between rather than within establishments. Tomaskovic-Devey et al. (2020) generalized this finding to a set of fourteen high-income countries: the between share of variance is rising in almost all countries (with the exception of Hungary). For Germany, thanks to an “AKM” – “Abowd-Kramarz-Margolis” (Abowd, Kramarz, and Margolis 1999) – decomposition, Card, Heining, and Kline (2013) also show that the growing establishment component is mostly due to the increased correlation between “workers’ fixed effects” and “establishments’ fixed effects,” which means there is an increased sorting of high earners into high-paying firms and low earners into low-paying firms. This also relates secondarily to the increase of the “establishments’ fixed effects,” i.e., the increase in the variance of establishment-specific positive and negative wage premiums. Studying the same phenomena in the US with similar techniques, Song et al. (2019) also find a strong increase in the correlation of firms’ and workers’ fixed effects, but no increase (and instead rather a decrease) in the evolution of firms’ fixed effects. They push the AKM decomposition one step further and isolate the specific role of “segregation” in the increase of the between-firm wage variance. This segregation, which they measure with the variance of firms’ average workers fixed effects, accounts for as much as the correlation of workers and firms fixed effects and for one third of the rise in between-firm wage variance. Moreover, in a

very recent study of change in US workplace inequality, Handwerker (2020) finds that workers in the bottom three earnings quintiles of the occupational structure increasingly have no co-workers in the top quintile in their workplace. These first results on the importance of earnings segregation at work in the United States call for a systematic and comparative study of segregation at work.

While our approach relates to previous work on the decomposition of wage variance, the focus on earnings segregation, based on intuitive measures of *exposures* of wage fractiles to one another in workplaces, comes with several advantages. First, our measures of the evolution of wage segregation based on wage ranks rather than on absolute wages are independent from the evolution of inequality. Contrary to Card, Heining, and Kline (2013) and Song et al. (2019), an increase in wage segregation can be measured when overall and between-wage variance increases, stagnates, or decreases. Second, in contrast with Song et al. (2019), we do not restrict segregation of workers to the assortative matching of workers by assumed productive characteristics measured with workers fixed effects in an AKM model. We consider the concentration of workers in establishments benefiting from a positive (or suffering a negative) wage premium to be part of the process of segregation between workplaces. Third, our measures tracing various wage groups' exposure to one another enable us to go beyond a single measure of segregation at work: the between share of variance. Indeed, our measurement strategy shows whether growing workplace earnings segregation happens mainly at the top, in the middle, or at the bottom of the earnings hierarchy. This shift is similar to Piketty's move from Gini-type measures of inequality to top income shares, revealing the social locations implicated by increases in inequality (Piketty 2014; Godechot 2017a). Fourth, we provide measures that can be compared easily with other forms of segregation, such as gender or nativity segregation, giving us a sense of which group distinctions are more extreme and dynamic. Finally, our exposure measures express directly workers' chances of interaction at work. Our approach does not focus attention solely on the economic causes of these trends but also invites us to think about the social consequences of proximity at work for social cohesion.

3 Administrative data for estimating exposure measures

In order to track the evolution of segregation at work, we use administrative data for eleven countries: Canada, Denmark, Sweden, Norway, France, Germany, Spain, Czechia, Hungary, Japan, and South Korea (Table 1). This enables us to base our analysis on one billion worker-year observations (up to fifty million workers per year). Some countries (Canada, Denmark, Norway, Sweden, and France) provide exhaustive information on the working population and permit very reliable estimates for small groups in small units. In Czechia and Hungary, the sample covers 80 and 50 % of the workforce respectively. In other countries (Germany, Spain, Japan, and South Korea), we have samples of between

4 and 8% of the working population. With respect to usual socioeconomic research, those last samples are very large and enable reliable estimates of most of our segregation measures. However, we must have in mind that estimates of segregation indicators for small groups, notably exposure of or to the national top 1%, could be a little more fragile. This is especially the case for Germany, where, in addition to a smaller sample, we had to impute top earnings as they are top coded around the top decile threshold.¹

In order to estimate evolutions of exposure, we select all workers above a yearly marginal wage threshold in units containing at least two workers. For each country, we selected a marginal wage appropriate to that country's administrative data and wage regulations (cf. Table 1 and Appendix A1). We use this cutoff to exclude cases with misreporting or job spells that are so short as to constitute failed hires, rather than low-paid jobs. Reporting units are primarily establishments, but for comparison purposes we also examine firms and municipalities (either of work or of residence) as units of analysis.

Exposure for earnings groups

For earnings fractile groups, we utilize traditional measures of exposure and isolation² (Bell 1954; Massey and Denton 1988). We focus primarily on earnings (i.e., yearly wages) from the observed job. We limit our sample to people who have been employed in the focal job either for a full year or – when information on starting and end dates are not available – have at least one year of seniority in the workplace. We do this in order to ensure that we measure exposure for employees present at the same time in the workplace. It also enables us to have full-year, rather than part-year, earnings.

We choose to use yearly earnings in our analysis for two reasons. First, it reflects “life chances” in Weberian terms; that is, the income on which people live thanks to their job. Second, it is the type of wage measure that is the most common in the register data we use for this paper. Some consider hourly wage to provide a better measure of wage because it is more closely tied to the concept of productivity. However, the number of hours is not an exogenous dimension. It depends on the preferences and the productivities of the worker and the firm, as well as on norms and eventual discriminations surrounding the allocation of working hours. Moreover, we are not interested in productivity, but rather propinquity. Among our robustness checks we compare yearly earnings results to the hourly concept and find similar trends.

1 Our imputation strategy uses contemporaneous and lagged information from both individuals and workplaces to predict high earnings, using a tobit function estimated for multiple education by gender for East/West German populations. Code and further discussion available upon request.

2 The exposure of a group to itself is called isolation.

Table 1 Characteristics of country linked employer-employee data

Country	Start	End	Field	Definition of marginal job threshold	Threshold earning (end year)	Num. workers in est size > 1 (end year)	Num. est. (end year)	Num. firms (end year)	Num. municipalities (end year)	Source
Canada	1990	2013	exhaustive	1/2 full time full year minimum wage	7,857 CAD	18,943,396	775,916*	764,872	158	Statistics Canada
Denmark	1994	2015	exhaustive	1/2 full time P10	89,172 DKK	1,576,388	100,248	69,875	99	RAS, IDAN and BES
Norway	1996	2014	exhaustive	1/2 full time P10	60,957 NOK	1,752,512	120,412	77,882	428	Statistics Norway
Sweden	1990	2012	exhaustive	1/3 prime age P50	93,210 SEK	3,754,170	238,966	170,144	290	Statistics Sweden
France	1993	2016	exhaustive private and semi-public sectors	1/2 full time full year minimum wage	7,736 EUR	14,509,315	968,872	745,774	36,672	DADS
Germany	1999	2015	sample of workers (6%) in 20,000 establishments	1/2 full time P10	12,119 EUR	1,119,590	9,713	missing	402	IEBS
Spain	2006	2017	Random sample of workers (4%)	1/2 full time full year minimum wage	4,954 EUR	239,159	47,637	39,387	224	Continuous Sample of Working Histories (CSWH) and tax records
Czechia	2002	2016	sample of workers (80%)	1/2 full time full year minimum wage	52,830 CZK	1,917,812	27,667	16,602	78	Average Earnings Information System (ISPV) survey
Hungary	2003	2011	sample of workers (50%)	1/2 full time yearly minimum wage	468,000 HUF	1,017,665	missing	81,837	3,109	Admin2
Japan	1990	2013	sample of workers (4%) out of a sample of private sector establishments size > 5	1/2 full time P10	1,056,700 JPY	994,687	56,277	missing	1,765	Basic Survey of Wage Structure
South Korea	1990	2012	sample of workers (8%) out of a sample of private sector establishments size > 5	1/2 full time full year minimum wage	4,763,200 KRW	613,369	17,327	missing	missing	Korean Ministry of Labor

* We don't have establishments for Canada. Establishments are proxied through an intersection between province and firm.

The exposure ${}_gP_h^*$ of group g to group h is simply the average of the proportion of group h in group g 's local unit i . It is generally defined as:

$${}_gP_h^* = \sum_i \left(\frac{n_{gi}}{n_g} \right) \cdot \left(\frac{n_{hi}}{n_i} \right) \quad (1)$$

where n_{gi} is the number of workers of group g in unit i .

To produce more robust estimates of exposure for small groups in small units (for instance the top 1 % in small establishments), we adapt this measure according to the “drop one” rule (Hellerstein and Neumark 2008). We consider that an individual is not exposed to herself. For instance, in an establishment of two workers, one belonging to the national top 1 % and one to the national bottom 25 %, we consider that the worker from the top 1 % is exposed to 0 % of the top 1 % workers, and 100 % of the bottom 25 % of workers (and not 50 % and 50 % respectively as computed with the traditional measure). This corresponds in fact to the initial P – “the probability that the next person a random individual from group 1 will meet is from group 2” – from which Bell (1954) derived the approximation P^* .

$${}_gP_h = \sum_i \left(\frac{n_{gi}}{n_g} \right) \cdot \left(\frac{n_{hi} - 1_{h=g}}{n_i - 1} \right) \quad (2)$$

where $1_{h=g}$ is equal to 1 when $h=g$ and 0 otherwise.

This measure comes with several interesting properties. When we use it for measuring the exposure of national earnings fractiles to one another, such as the top 1 % exposure to the bottom 25 %, we can make robust and simple comparison through time and space, as the given earnings groups are each a constant proportion. We can also easily make comparisons to a benchmark corresponding to a perfectly non-segregated society. In such cases, ${}_{top1\%}P_{q1}$ would be equal to 25 %. Exposure also has interesting quasi-symmetry properties: cross-exposures are linked by a multiplicative parameter $(n_h/n_g) : {}_gP_h = (n_h/n_g) \times {}_hP_g$. For instance, ${}_{top1\%}P_{q1} = 25 \cdot {}_{q1}P_{top1\%}$. This means that the patterns described for ${}_gP_h$ will hold true for ${}_hP_g$. Hence, when based on groups of equal size, such as deciles, cross-exposures are equal (Massey and Denton 1988).

Moreover, contrary to other classical measures such as the Duncan and Duncan dissimilarity index, the measure remains robust for groups and units both small and heterogeneous in size. The dissimilarity index measures a distance to an even distribution. However, it uses a benchmark where evenness is achieved in each unit, which is unlikely when units and groups in those units are small. Consequently, a randomized distribution of persons in units will not produce a dissimilarity measure equal to zero. On the contrary, the even benchmark (n_h/n) for a given exposure measure ${}_gP_h$ is an average one.

Similarly, the measure is much more robust to sampling than the dissimilarity index or entropy-based measures (Logan et al. 2018). Hence, with French data we get similar exposure estimates with the DADS panel (1/12th of the population) as when we use the full population. This is not the case for dissimilarity measures (Godechot 2013).

As for any segregation measure, the most critical component is the number and size of the units. Our exposure measure is no exception. The more units used, the more fine-grained the measure of segregation will be.

Evolution of exposure

In order to compute comparable evolutions, we calculated the yearly rate of variation of exposure ratios. To do this, we compute the annualized odds ratio of the end year exposure to the start year exposure.

$$\Delta_g P_h = \exp \left[\frac{1}{(t_2 - t_1)} \log \left(\frac{\frac{{}_g P_{h,t_2}}{1 - {}_g P_{h,t_2}}}{\frac{{}_g P_{h,t_1}}{1 - {}_g P_{h,t_1}}} \right) \right] \quad (3)$$

The advantage of the odds ratio is the ability to take into account that exposure measures are percentage bounded by 0 % and 100 %. It enables us to maintain the coherence between the evolution of exposure of group g to h and the evolution of group g to $-h$ (non- h): $\Delta_g P_h = 1/\Delta_g P_{-h}$.

We further subtract 1 to get a rate of growth comparable with other growth rates (economic growth, population growth, etc.).

$$rate(\Delta_g P_h) = \Delta_g P_h - 1 \quad (4)$$

Relative exposure

For earnings fractiles – defined at the national level – this simple measure enables robust and meaningful comparisons of propinquity through time and space. However, for groups whose size varies in time and space – such as gender, occupation, education groups – empirical measures of exposure will be sensitive to the size of the groups. In order to normalize for the group size and to provide more meaningful comparisons, we calculate a relative net exposure (Åslund and Skans 2010; Fiel 2013). Our measure of net exposure is defined as the odds ratio between the exposures of g to h and that of all other groups excluding g (i.e., $-g$) to h .

$${}_gR_h = \frac{\frac{{}_gP_h}{1-{}_gP_h}}{\frac{{}_{-g}P_h}{1-{}_{-g}P_h}} \quad (5)$$

This measure is symmetrical. The relative exposure of g to h equals the relative exposure of h to g : ${}_gR_h = {}_hR_g$ (cf. demonstration in Appendix A2).

Evolution of relative exposure

Here again, in order to compute comparable evolutions, we calculated the yearly rate of variation of relative exposure measures. For this purpose, we compute the annualized log difference of the end year relative exposure to the starting year relative exposure as follows:

$$\Delta_g R_h = \exp \left[\frac{\log({}_gR_{h,t_2}) - \log({}_gR_{h,t_1})}{(t_2 - t_1)} \right] \quad (6)$$

Finally, this rate of evolution comes with several advantages. It is symmetrical ($\Delta_g R_h = \Delta_h R_g$) and directly comparable to the rate of growth of exposure calculated with (3). Or to put it differently, if we calculate rate of growth for earnings fractile exposure with both (3) and (6), we get similar estimates. We further transform this evolution ratio into a rate as in equation (4).

4 A strong increase in earnings segregation at work

Our notion of exposure is therefore well suited for estimating the heterogeneity of segregation at work along the earnings dimension and its variation in time and space. It enables us to trace the earnings groups to which a given group is increasingly or decreasingly exposed at work

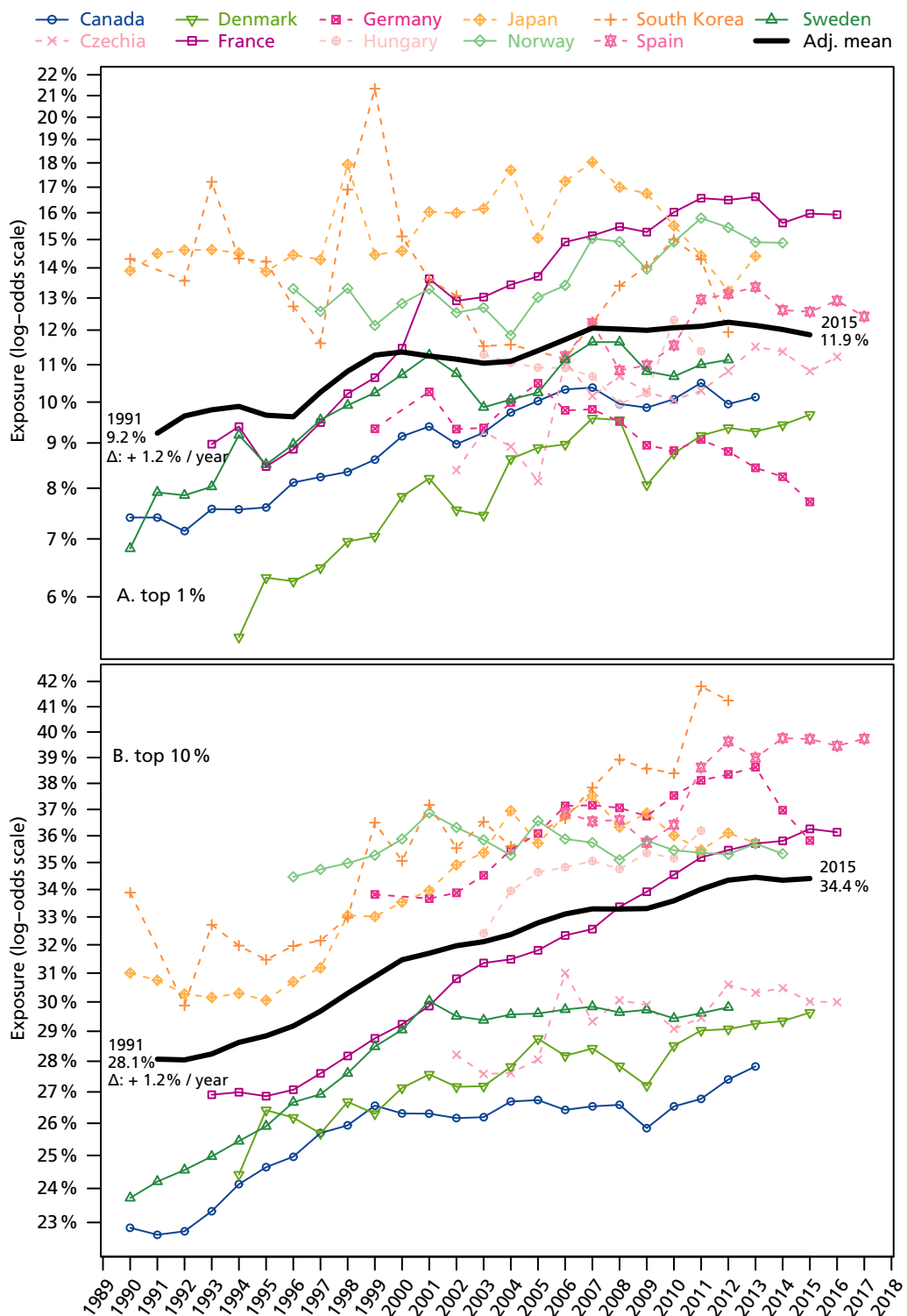
Two decades of research on distributional inequality (Piketty 2014) and more recent research on residential segregation (Tammaru et al. 2015; Musterd et al. 2017) have shown that a dramatic and specific trend is occurring for top earners, leading classical global indicators of inequality such as the Gini or Duncan index to misrepresent the magnitude of the evolution. Therefore, when moving to the analysis of segregation at work, this invites us to focus first on the segregation of top earners, a group that we will approach with two measures: employees belonging to the national top 1 % and 10 % of earners respectively.

Figure 1 displays the evolution of top earner isolation. This measure documents both the evolution of top earners' exposure to themselves and summarizes the complementary inverted evolution of their exposure to all other earnings groups. During the period, top 1 % isolation increased substantially, notably in countries where exhaustive data (Canada, Scandinavian countries, and France) or quasi-exhaustive data (transitioning economies) make it possible to measure it most accurately. In 1994, France's national top 1 % worked in establishments where 9 % of their coworkers belonged to the same earnings group. In 2015, 16 % of their coworkers belonged to the national top 1 %. Hence, isolation index nearly doubled in 21 years, with a substantial +3.2 % yearly rate of increase. And, as a result of symmetrical properties of our segregation measures, top 1 % exposure to the bottom 99 % declined from 91 % to 84 %, at an inverted rate of -3.1 % per year. These trends towards separation of the most affluent workers from the rest of the earnings hierarchy are less dramatic in other countries, but nevertheless remain pronounced. We also find a substantial move towards top earner isolation in Denmark (+2.6 %), Sweden (+2.1 %), Czechia (+2.1 %), Canada (+1.7 %), Spain (+1.3 %) and Norway (+1.1 %) (Table 1). Conversely, with this measure, we do not see any increase in top earner isolation in Japan, South Korea, and Germany. In the two Asian countries, this may be due to sampling issues (as shown by the volatility of the curves and the larger confidence intervals, cf. supplementary Figure S1) and to the fact that executives are not included in the data in Japanese firms. The singularity of the German decrease in top 1 % isolation (-1.3 %) may also be owing to the top coding of earnings at a relatively low level (around P90), which our imputation strategy imperfectly overcomes.

These plausible limitations in our data led us to also consider top 10 % isolation, a more robust proxy for top earnings (Figure 1B). The magnitude of the increase is attenuated for "population data" countries, but we do find for the "sample data" countries a more consistent trend towards isolation of top earners. Growing isolation of the top 10 % appears to be a general and homogenous trend that we find in almost all countries. Its yearly rate of increase ranges in most countries between +1 and +2.1 % per year. Norway is the sole exception with no clear increase (+0.2 %). In no country is top earner integration with others growing.

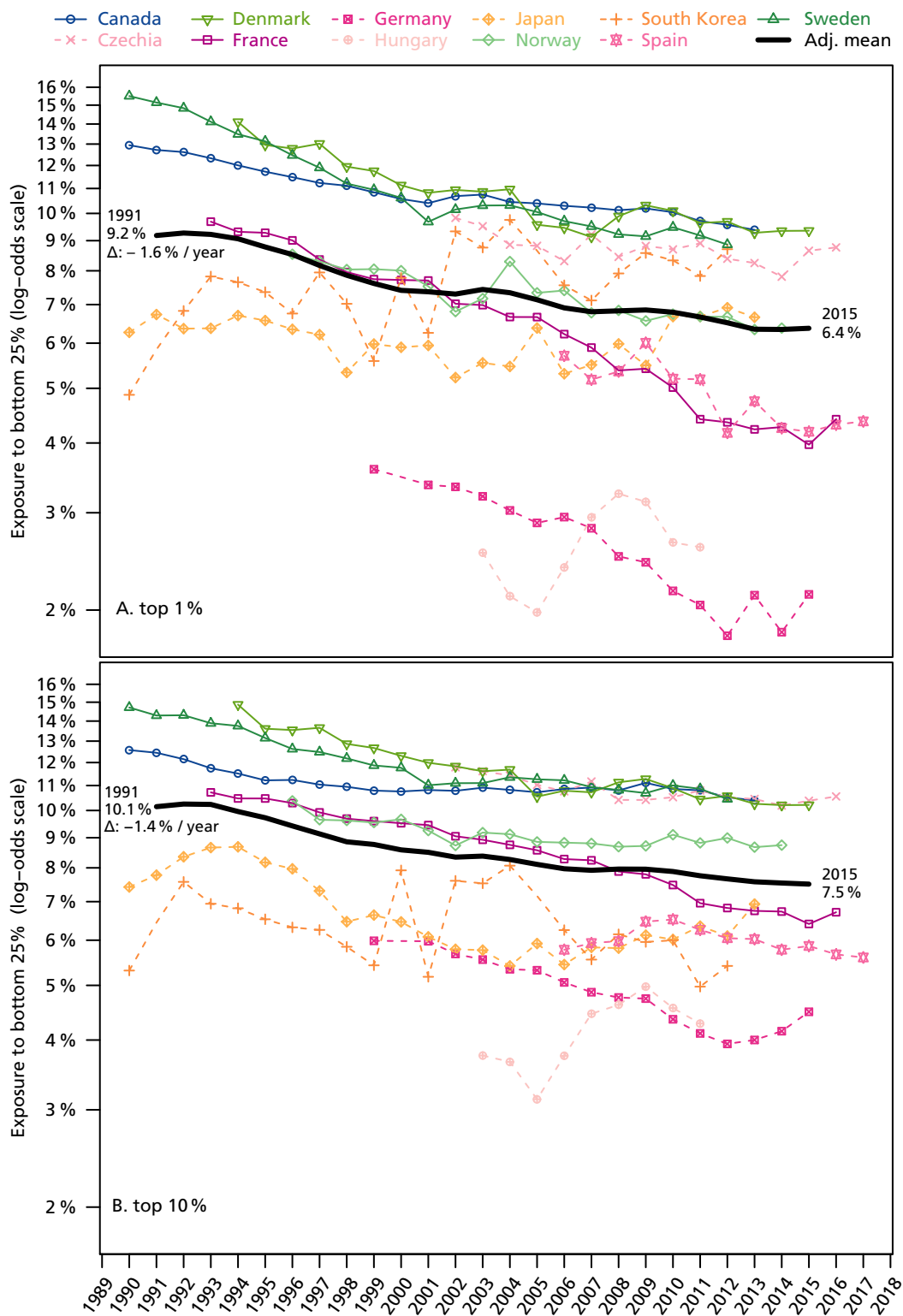
Growing top earner isolation and consequently declining exposure to the rest of the earnings hierarchy is not homogenous. Figure 2 makes clearly visible that top earners in almost all countries are separating mostly from employees at the bottom of the earnings hierarchy. This evolution is particularly striking for France, where top 1 % exposure to the bottom quartile decreased at a -4 % annual rate. We also find that the change in the level of propinquity declined substantially in eight out of eleven countries, with rates of decrease ranging from -1 % to -4 %. We do not find similar trends for Hungary, South Korea or Japan, possibly for the sampling and measurement reasons previously mentioned.

Figure 1 Top earner workplace isolation



Note: Sources are detailed in Table 1 and Appendix A1, and the figure construction (scale and adjusted mean) in Appendix A3. The increase rate of exposure rates is calculated according to equations 3 and 4.

Figure 2 Top earner workplace exposure to bottom earners



The decline in top 10 % exposure to the bottom quartile is both a little less pronounced than that of the top 1 % (especially in France [−2.5 % versus −4.1 %], Sweden [−1.7 % versus −2.8 %] and Spain [−0.4 % versus −2.7 %]) and also more general: Japan and South Korea follow this trend of growing elite isolation, although at a slower pace. Only Hungary (for which we have a shorter timeframe) contradicts the pattern, showing an increased propinquity between its earnings elite and its bottom earners.

Supplementary Figure S2 shows that the growing separation of top earners from bottom earners also holds true for mid-quartile earners. Hence, top 1 % exposure to the F25-75 earnings group dropped in France from 34 % to 20 % and in Sweden from 39 % to 30 %. If we add top earner exposure to the bottom and mid quartiles, we find for some countries dramatic drops that could be viewed as a fundamental change in elite segregation from the rest of society. In France, top 1 % exposure to the bottom 75 % dropped from 44 % at the beginning of the period to 24 % at the end. Sweden moves from 55 % to 39 % and Canada from 57 to 46 %.

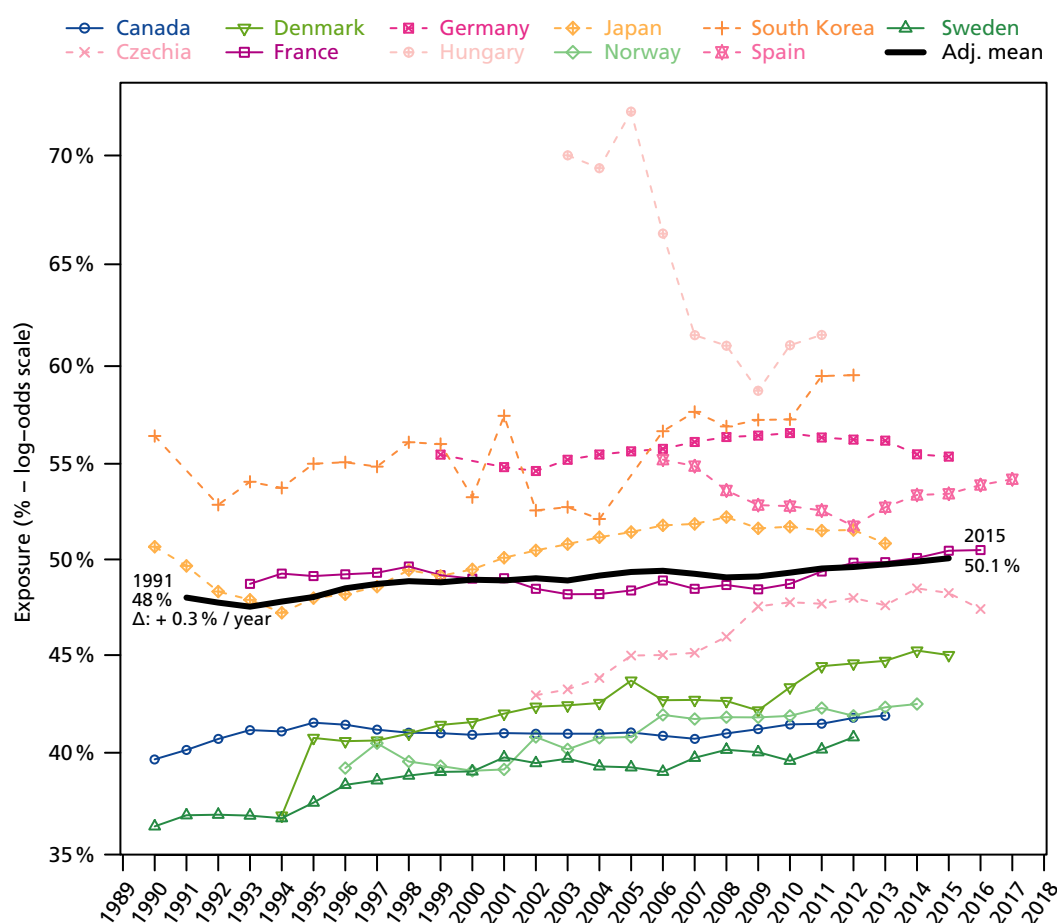
One may think that underlying these separation trends are mechanisms of assortative matching of workers by earnings as a phenomenon uniformly affecting the wage hierarchy. In contrast, we find that isolation trends are much less pronounced at the bottom of the earnings hierarchy than at its top (Figure 3 and Table 2) and that trends are less general. While some countries (Denmark and Czechia, and to a lesser extent South Korea, Norway, and Sweden) face increasing segregation at the bottom, others, such as Hungary, France, Spain, Germany, Canada, and Japan, do not. For instance, in France, contact between the bottom quartile and mid quartiles increases. These results show that the assortative matching mechanisms (Kremer 1993) invoked for explaining the growing job polarization between high-paying and low-paying firms (Card, Heining, and Kline 2013; Song et al. 2019) are primarily present at the very top of the earnings hierarchy.

Table 2 and supplementary Figure S3 – where we plot the yearly rate of evolution of each decile exposure to one another – enable us to summarize the common patterns in the evolution of segregation at work and the main contrasts between countries.

First, we find a consistent and significant increase in top earner workplace isolation when proxied either with the top 10 % exposure measure (Korea, Japan, Germany), with the top 1 % one (Norway), or with both (all other countries). Second, in almost all countries (except Hungary) the exposure of top earners to bottom earners decreased. Third, in the majority of countries their exposure to bottom earners decreased more than to all other groups. Fourth, in the majority of countries, the most dramatic shift in the evolution of segregation concerns top earners.

Beyond the general pattern of increased top earner isolation common to all countries, we can also establish secondary contrasts between three groups of countries. France, Canada, Germany, Sweden, and (to a lesser extent) Spain are countries following the general pattern where segregation increases mainly at the top, which decreases its exposure to all

Figure 3 Bottom 25 % workplace isolation



other groups and most notably to bottom ones. Some countries present a combination of growing isolation both at the top and the bottom of the earnings hierarchy, notably Norway, Denmark, and moreover Czechia.³ Japan, South Korea, and even more so Hungary are countries where separation of top earners increases more from middle earners (D3 in Japan, D5 in South Korea and Hungary) but decreases from the bottom 10%.⁴ It is worth noting that those groups do not follow the usual patterns of the comparative capitalism

3 As Figure S3 shows, Czechia's evolution is particularly notable, with a visible segregation process at work all along the earnings hierarchy, and even more pronounced at its bottom than its top. In this country, indeed, for all deciles, isolation increases and exposure to one another decreases. This produces a mountain range type of graph where the local summits correspond to each decile's evolution toward isolation.

4 We find the unexpected pattern of Hungary, with a very strong desegregation of D1 and D2. We know from our earlier work that Hungary also has a decline in both overall wage inequality and between firm wage inequality across this period (Tomaskovic-Devey et al. 2020). If the social distance between earnings deciles is declining, the pressure for segregation may be as well. In addition, the accession of Hungary to the European Union in 2004 might have produced a re-organization of Hungarian firms' earnings structure (although not in parallel with the other EU nations in our sample). The combination of the high share of workers on/around the minimum

Table 2 Evolutions and levels of wage group segregation in establishments

	Canada	Denmark	Norway	Sweden	France	Germany	Spain	Czechia	Hungary	Japan	South Korea	Adj. mean
Yearly evolutions												
Δ top 1 % isolation	+1.7 %	+2.6 %	+1.1 %	+2.1 %	+3.1 %	-1.5 %	+1.3 %	+2.1 %	+0.4 %	-0.1 %	-0.1 %	+1.2 %
Δ top 10 % isolation	+1.2 %	+1.0 %	+0.2 %	+1.4 %	+2.1 %	+1.1 %	+1.4 %	+1.0 %	+1.4 %	+1.1 %	+1.9 %	+1.2 %
Δ top 1 % exp. to mid-quartiles	-1.5 %	-1.0 %	-1.1 %	-2.2 %	-3.5 %	-2.2 %	-1.7 %	-1.4 %	-2.2 %	-1.3 %	+0.9 %	-1.4 %
Δ top 10 % exp. to mid-quartiles	-0.6 %	-0.3 %	-0.5 %	-1.2 %	-1.7 %	-1.6 %	-1.3 %	-0.8 %	-3.4 %	-1.5 %	-2.1 %	-1.2 %
Δ top 1 % exp. to bottom 25 %	-1.5 %	-2.1 %	-1.7 %	-2.8 %	-4.0 %	-3.9 %	-2.7 %	-1.0 %	+4.1 %	+0.2 %	+1.9 %	-1.6 %
Δ top 10 % exp. to bottom 25 %	-0.9 %	-1.9 %	-0.8 %	-1.7 %	-2.4 %	-2.6 %	-0.4 %	-1.1 %	+4.8 %	-1.0 %	-0.9 %	-1.4 %
Δ bottom 25 % isolation	+0.3 %	+1.2 %	+0.6 %	+0.7 %	+0.3 %	+0.2 %	-0.3 %	+1.6 %	-7.1 %	+0.3 %	+0.9 %	+0.3 %
Δ bottom 10 % isolation	+0.1 %	+2.9 %	+1.5 %	+0.8 %	+0.2 %	-0.3 %	-1.0 %	+1.9 %	-1.7 %	-1.0 %	+1.7 %	+0.5 %
Year	2012	2014	2013	2011	2015	2014	2016	2015	2010	2012	2011	2015
Levels (last 3-year average)												
top 1 % isolation	10 %	9 %	15 %	11 %	16 %	8 %	13 %	11 %	11 %	14 %	14 %	12 %
top 10 % isolation	27 %	29 %	35 %	30 %	36 %	37 %	40 %	30 %	36 %	36 %	40 %	34 %
top 1 % exp. to mid-quartiles	37 %	32 %	24 %	30 %	20 %	18 %	25 %	28 %	24 %	30 %	34 %	27 %
top 10 % exp. to mid-quartiles	39 %	37 %	32 %	35 %	31 %	29 %	28 %	36 %	33 %	32 %	27 %	32 %
top 1 % exp. to bottom 25 %	10 %	9 %	6 %	9 %	4 %	2 %	4 %	8 %	3 %	7 %	8 %	6 %
top 10 % exp. to bottom 25 %	11 %	10 %	9 %	11 %	7 %	4 %	6 %	10 %	5 %	6 %	5 %	8 %
bottom 25 % isolation	42 %	45 %	42 %	40 %	50 %	56 %	54 %	48 %	60 %	51 %	59 %	50 %
bottom 10 % isolation	20 %	29 %	24 %	19 %	32 %	35 %	28 %	30 %	43 %	35 %	50 %	31 %
Between workplace share of earnings variance Δ	+0.5 %	+2.2 %	+0.5 %	+1.8 %	+1.8 %	+1.6 %	+0.1 %	+2.0 %	-1.8 %	+0.8 %	+2.0 %	+1.2 %
Earnings inequality												
Δ top 1 % share	+1.3 %	+1.5 %	+1.6 %	+1.2 %	+0.9 %	+0.0 %	+0.1 %	+0.8 %	-0.2 %	+0.6 %	+0.4 %	+0.9 %
Δ top 10 % share	+0.7 %	+0.6 %	+1.0 %	+0.5 %	+0.3 %	+0.5 %	+0.1 %	+0.7 %	-0.3 %	+0.3 %	+0.5 %	+0.4 %

Note: In order to avoid artificial changes due to specificities of data collection for some years, we calculate levels and evolutions with a three-year moving average. For instance, exposure at the end of period for Canada calculated in 2012 is the average for 2011, 2012, and 2013. The evolution rates of exposure rates are calculated according to equations 3 and 4.

literature (Esping-Andersen, 1990; Hall and Soskice, 2001). On the contrary, a variety of market economies (“liberal,” “social-democratic,” and “corporatist”) constitute the first majority group and illustrate the generality of the phenomenon uncovered.

Finally, in order to put in perspective growing top earner segregation – our main finding common to all countries – it is tempting to compare it with two related phenomena (Table 2): the increase of the between-workplace share of earnings variance on the one hand and the evolution of distributional inequality on the other.

Top earner isolation and between-workplace share of earnings variance are linked, but the latter all-encompassing measure might miss the heterogeneity of the segregation process. Even in countries where this measure increased slowly (Canada, Japan, and Spain) or even decreased (Hungary), top 10 % isolation increased substantially.

Following Piketty and Saez’ seminal work (2003), many consider that top earnings share increased at a rapid pace and this development constitutes a major transformation of our contemporary society. As shown in Table 2, the rate of increase in isolation of top earners is faster (except in Norway) than the rate of increase in their respective earnings share. The comparison of Figure 1 and Figure S4 also shows top 1 % earners have a more unequal share of top 1 % coworkers (12 % on average at the end of the period) than of earnings (6 %). Moreover, we see that the two phenomena follow different patterns, notably after the 2008 financial crisis. For instance, in Canada, the top 1 % earnings share dropped sharply and, in France, it stabilized. Conversely, top 1 % isolation continued increasing in France and only stabilized in Canada.

5 A robust trend

One could wonder whether the increase in top earner segregation established above remains conditional to our measurement conventions such as the nature of the units or to the earnings concept, and whether it might be owing to compositional changes in the establishment size, industry, or geographic distribution of employment.

In order to assess the robustness of our findings, we conduct such checks in Table 3. Using firms instead of establishments and hourly wage instead of yearly earnings leads to very similar conclusions. Moreover, growing segregation of top earners occurs both within small establishments and large establishments, within finance, manufacturing, and other sectors, and within the large financial metropolis and the hinterlands. These

wage (especially in D1 and D2) and increases in the minimum wage between 2005 and 2006 could account for the unusual Hungarian pattern.

Table 3 The robustness of top earner segregation

	Canada	Denmark	Norway	Sweden	France	Germany	Spain	Czechia	Hungary	Japan	South Korea	Adj. mean
<i>Δ Top 10% isolation (1 year)</i>												
baseline	(+1.2%)	+1.0%	+0.2%	+1.4%	+2.1%	+1.1%	+1.4%	+1.0%	(+1.4%)	+1.1%	+1.9%	+1.2%
alt. unit: firms	+1.2%	+0.8%	+0.3%	+1.5%	+1.9%		+1.6%	+0.5%	+1.4%			+1.1%
alt. wage notion: hourly wage		+0.4%			+2.0%		+1.5%		+1.4%	+1.0%	+0.9%	+1.4%
size: ≤50	+0.5%	+1.9%	+1.2%	+1.8%	+3.3%	+2.2%	+1.1%	+2.7%	-1.4%	+1.4%	+5.1%	+1.9%
51-200	+1.8%	+1.2%	-0.4%	+2.4%	+2.1%	+1.2%	+3.4%	+2.3%	+0.5%	+1.5%	+2.4%	+1.8%
>200	+1.8%	+0.2%	-1.5%	+0.2%	+2.0%	+0.4%	+2.6%	+0.3%	+2.6%	+0.9%	-0.4%	+0.6%
sector: finance	+0.7%	+0.3%	-0.4%	+1.6%	+3.5%	+2.5%	+2.6%	+1.0%	-4.7%	+1.0%	+3.5%	+1.7%
manufacturing	+1.8%	+1.1%	-3.4%	+1.8%	+1.8%	+0.4%	+0.5%	+0.1%	+1.0%	+1.3%	+4.8%	+1.3%
other	+1.5%	+0.9%	+1.4%	+1.6%	+2.5%	+1.7%	+2.7%	+2.5%	+2.9%	+1.5%	+2.1%	+1.8%
region: financial center	+1.2%	+1.1%	-0.6%	+1.8%	+2.9%	+1.2%	+2.3%	+1.0%	+2.1%	+1.7%		+1.5%
rest of the country	+1.6%	+1.2%	+0.3%	+1.5%	+2.7%	+1.5%	+2.0%	+1.6%	+2.3%	+1.2%		+1.6%
<i>Δ Top 10% exposure to bottom quartile (1 year)</i>												
baseline	(-0.9%)	-1.9%	-0.8%	-1.7%	-2.4%	-2.6%	-0.4%	-1.1%	(+4.8%)	-1.0%	-0.9%	-1.4%
alt. unit: firms	-0.9%	-1.4%	-0.8%	-1.7%	-2.2%		-0.4%	-0.7%	+4.8%			-1.3%
alt. wage notion: hourly wage		-1.1%			-2.6%		+0.4%		+4.4%	-0.7%	-1.1%	-1.7%
size: ≤50	-0.4%	-1.7%	-1.5%	-1.3%	-2.2%	-1.0%	-1.4%	-3.0%	+9.1%	-0.5%	-3.0%	-1.2%
51-200	-1.3%	-1.2%	-0.3%	-1.8%	-2.1%	-1.6%	-2.2%	-1.2%	+1.9%	-0.8%	+0.2%	-1.2%
>200	-1.4%	-2.2%	+0.8%	-1.0%	-2.4%	-3.0%	-0.3%	-0.6%	-1.7%	-1.7%	+4.5%	-0.6%
sector: finance	-0.9%	-0.1%	+0.7%	-1.6%	-2.1%	-3.5%	-4.3%	-1.2%	+1.8%	-0.9%	-1.8%	-1.5%
manufacturing	-0.5%	-1.9%	+1.3%	-1.6%	-1.8%	-3.3%	+3.3%	+0.1%	+3.2%	-1.7%	-3.6%	-1.1%
other	-0.9%	-1.6%	-1.4%	-1.4%	-2.3%	-1.9%	-1.0%	-2.3%	+6.3%	-0.8%	-1.2%	-1.3%
region: financial center	-1.4%	-2.4%	-1.2%	-2.4%	-3.4%	-2.4%	-0.5%	-0.8%	+7.5%	-2.6%		-2.0%
rest of the country	-0.9%	-2.0%	-0.7%	-1.6%	-2.3%	-2.7%	-0.4%	-1.7%	+4.6%	-0.4%		-1.4%

Note: To avoid artificial changes due to specificities of data collection for some years, we calculate levels and evolutions with a three-year moving average. In Canada and Hungary, we do not have information on establishments and firms serve as baseline units. For size, sector and region, we use a notion of relative exposure to measure evolution of segregation within groups, net of the evolution of group composition. The evolution rates of exposure rates are calculated according to equations 3 and 4 (absolute exposure) and equations 6 and 4 (relative exposure).

robustness checks show the generality of the phenomenon, document sources of variation, and identify the social contexts in which the trend towards elite segregation is more pronounced.

Firms versus establishments. For countries where we have information on both establishments and firms (the Scandinavian countries, France, Spain, and Czechia), we can compare levels of segregation and evolutions based on both work units. Our main results hold globally for firms and add that segregation occurs mainly between firms rather than between establishments of the same firm.

Yearly earnings versus hourly wages. In the set of countries for which we have a reliable hour measure (Denmark, France, Spain, Hungary, Japan, and South Korea), we compare segregation measures based on hourly wages with those based on yearly earnings. Generally, trends towards growing isolation of top earners and towards growing separation of this group from bottom earners are similar, regardless of the wage concept. The main difference consists in a slightly stronger process of segregation when we use yearly earnings. Most top earner segregation is due to the sorting of the workers between workplaces, and a small fraction is due to sorting in the number of hours. This fraction is slightly higher in Spain.

Small versus large establishments. Davis (2016) argues that the rise in US inequality happened mainly because of the decline in firm size, with larger firms being more egalitarian. This intriguing result for the United States leads us to explore whether the trend towards a growing separation of top earners is due to a compositional effect related to establishment size. In order to discount the compositional effect due to the relative increase in proportion of small versus large workplaces and their composition in terms of high and low earners (cf. supplementary Table S1⁵), we use here a relative exposure measure (cf. Section 2) to narrow to the evolution of segregation within small, medium, and large workplaces. This exercise shows that isolation of top earners and separation of the latter from bottom earners generally happen within small, medium, and large establishments. However, in line with Davis (2016), it is true that the increase in segregation is on average twice as pronounced in small (≤ 50) and medium-sized (51–200) than in large workplaces (> 200).

Industry: finance, manufacturing, and other sectors. One could think that the surge in wages in finance (Philippon and Resheff 2012; Godechot 2012) might account for the increase in segregation. Firms involved in financial market activities and offering very

5 Table S1 provides details of the contribution of composition to segregation and shows that the latter is complex and goes in multiple directions. In line with Davis (2016), we see in a significant number of countries (but not all) an increase in smaller workplaces and a decrease in larger ones. Large establishments have a larger share of top earners and a lower share of bottom earners, a specificity which has been accentuated during the last twenty years. Those establishments are thus more segregated when we use a notion of absolute exposure. Within their size categories, however, large establishments segregate relatively fewer top earners.

high wages distort both the wage structure and the patterns of segregation. In those firms, high earners are mainly exposed to similar others and very little to the rest of the wage distribution. Similarly, another industry composition effect may relate to the globalization of manufacturing during the last twenty years in western economies. The growing global competition has led to the relocation of low-skilled tasks to developing countries, increasing the separation between conception and production and therefore between top earners and bottom earners.

Beyond complex compositional effects, detailed in Table S2, we find that segregation increased within finance, manufacturing, and other sectors, but that the rhythm is on average half as pronounced in manufacturing as in other sectors.

Large financial metropolis versus hinterlands. The geographical split between the large urban metropolis and the rest of the country is growing in many countries (Godechot 2013). As Sassen's (2001) pioneering work has shown, global cities which are also major financial centers and often political capitals concentrate highly skilled idiosyncratic jobs necessary to the coordination of globalized, dispersed, and standardized economic activity. This structural phenomenon could account for the increase in income segregation. Table 3 shows that once the occupational effect is discounted (such as the higher and increasing proportion of top earners in financial centers, cf. Table S3), relative segregation increases at approximately the same rhythm both within financial centers and within the hinterlands. Variations in rhythm are only of second-order importance: the relative separation of top earners from bottom earners is only somewhat more pronounced within financial centers than within the rest of the country.

French robustness tests

We conducted a final series of robustness checks on the French case, where segregation of top earners increased the most.

We looked first at whether the increase in segregation occurred mainly between or within detailed geographical units (measured with one hundred French *départements*), detailed industry categories (measured with 800 four-digit industry codes), or establishments. A simple way of decomposing such evolution is to estimate a linear time trend of establishment exposure during the twenty-three-year period and to measure the change in this trend when adding geographical, industrial, or establishment fixed effects respectively. As shown by Table A4, the trend declines by 8–9 % when controlling for geographical units, by 22 to 33 % when controlling for detailed 4-digit sector and by 57 % to 62 % when controlling for establishment fixed effects. This decomposition shows that a great deal of change in establishment exposure is due to changes between establishments (creation,

destruction, changes in the wage position of the establishment). Within-establishment transformations, such as changes in its jobs and workers composition, account nevertheless for a substantial part (38 %) of the evolution of segregation.

Second, we examined whether the evolution of segregation was due to temporary wage shocks or to more permanent earnings and workers' productive characteristics. In Figure A4, we thus compare our main measures of earnings segregation with those calculated with two alternative methods: first, instead of yearly earnings we use the five-year individual fixed effects in order to measure the five-year average earnings segregation; second, we apply AKM modeling (Abowd, Kramarz, and Margolis 1999; Card, Heining, and Kline 2013; Song et al. 2019) in order to estimate earnings segregation based on five-year individual fixed effects net of establishment positive or negative wage premiums (cf. Appendix A4 for more details). Provided the AKM model estimates individual productivity accurately, this method estimates the evolution of segregation by workers' levels of productivity.

Figure A4 shows globally similar evolutions for yearly earnings, five-year average earnings, and five-year average earnings net of establishments' wage premiums. We find that within five-year periods, top 10 % exposure to bottom 25 % based on five-year individual fixed effects is smoothed a little compared to our baseline earnings segregation measure. This shows that the increase in segregation is only partly due to the renewal of workers with different productive characteristics and is also owing to short-term change in establishments' position in the wage structure.

Increasing workplace earnings segregation appears to be quite general and cannot be reduced to a compositional effect. At the same time, increasing workplace earnings segregation is generally weaker in larger firms, manufacturing, and outside of major cities.

6 A specific trend

Is this growing earnings segregation at work a specific phenomenon? Or is it just the manifestation of growing segregation along all social dimensions? In Table 4 we compare segregation along nativity, gender, age, education, and occupation dimensions. Contrary to earnings fractiles, other social dimensions, especially those less related to earnings, such as nativity, gender, and age, do not show homogenous and uniform trends towards more segregation. Only occupation, which is strongly correlated with earnings, shows a pattern of increasing segregation at work similar to that found for earnings segregation. This analysis confirms the specificity of the increase in earnings segregation.

Table 4 The specificity of top earner segregation

	Canada	Denmark	Norway	Sweden	France	Germany	Spain	Czechia	Hungary	Japan	South Korea	Adj. mean
<i>End year level</i>												
top 1 % earners	12.4	11.3	20.5	13.5	21.9	9.4	16.2	13.8	14.1	18.6	18.1	14.7
top 10 % earners	4.3	4.9	7.1	5.0	7.4	7.9	9.1	5.1	7.2	7.2	9.6	6.6
nativity: migrant	4.6	5.1	4.7	3.5	4.7	4.0	4.2					4.4
gender: female	2.9	3.9	4.5	4.2	3.4	4.3	3.2	3.6	3.1	3.5	3.8	3.6
age: > 55	1.7	1.5	1.6	1.6	1.5	1.5	2.0	1.6		2.4	5.2	1.9
< 31	2.1	2.5	2.5	2.3	2.1	1.7	2.7	1.8		1.9	2.4	2.2
education: tertiary		5.2	4.7	4.1		4.3	4.2		2.4	4.5	6.3	4.3
occupation:												
managers & professionals		6.8		5.3	5.5	10.2	8.5	5.9	2.8	5.4	6.8	6.2
working-class employees		6.4		7.2	4.4	8.8	9.2	5.6	4.1	7.0	7.7	6.7
<i>Yearly evolution</i>												
top 1 % earners	+1.9 %	+2.9 %	+1.2 %	+2.3 %	+3.5 %	-1.6 %	+1.4 %	+2.4 %	+0.4 %	-0.2 %	-0.1 %	+1.4 %
top 10 % earners	+1.5 %	+1.3 %	+0.3 %	+1.8 %	+2.8 %	+1.5 %	+2.0 %	+1.3 %	+2.0 %	+1.5 %	+2.6 %	+1.7 %
nativity: migrant	-2.1 %	+1.0 %	+0.2 %	+1.1 %	+1.7 %	-0.9 %	-1.2 %					+0.0 %
gender: female	-0.2 %	+0.1 %	-0.2 %	-0.0 %	-0.1 %	-0.3 %	-2.0 %	+1.1 %	-0.4 %	+0.4 %	+0.4 %	-0.1 %
age: > 55	-0.8 %	-0.2 %	+0.3 %	+0.0 %	-2.2 %	-1.0 %	-0.6 %	+0.1 %		-1.5 %	+0.8 %	-0.3 %
< 31	+0.7 %	+1.6 %	+1.1 %	+1.6 %	+0.5 %	+0.2 %	+3.3 %	+1.0 %		-0.5 %	+0.8 %	+0.8 %
education: tertiary		-0.1 %	+0.5 %	+0.1 %		-2.1 %	+0.8 %		+1.1 %	-0.6 %	+1.8 %	+0.1 %
occupation:												
managers & professionals		+1.3 %		+0.3 %	+2.6 %	-1.3 %	+0.5 %	+2.3 %	+0.9 %	+1.1 %	+1.3 %	+1.5 %
working-class employees		+3.5 %		+2.0 %	+2.3 %	+1.1 %	+2.6 %	+2.5 %	+1.3 %	+0.9 %	+2.3 %	+1.9 %

Note: To avoid artificial changes due to specificities of data collection for some years, we calculate levels and evolutions with a three-year moving average. The evolution rates of relative exposure rates are calculated according to equations 6 and 4.

Nativity. The increase in the share of migrants among the working population leads to increased exposure to migrants for both migrants and the native born (Figure S5). As explained previously in the method section, in order to control for this growth of exposure due to the simple growth of size, we adopt here the notion of relative exposure (Figure 4A). It shows a substantial level of segregation among the seven countries which can be compared to top 10 % segregation at the beginning of the period (Table 2). Migrants are 4.4 times (in terms of odds ratio) more exposed to migrants than non-migrants are. Although high, this level of segregation remains less pronounced than that estimated for top 10 % earners (for which the relative isolation odds ratio is 6.5). Figure 4A shows no overall pattern in the evolution of segregation along this dimension. Patterns contrast sharply between countries. Hence, relative isolation of migrants at work increased at a yearly rate of +1.7 % in France and +1.1 % in Sweden but decreased by a factor of -2.1 % in Canada, -1.2 % in Spain and -0.8 % in Germany. Nativity segregation remained stable in Norway and Denmark.

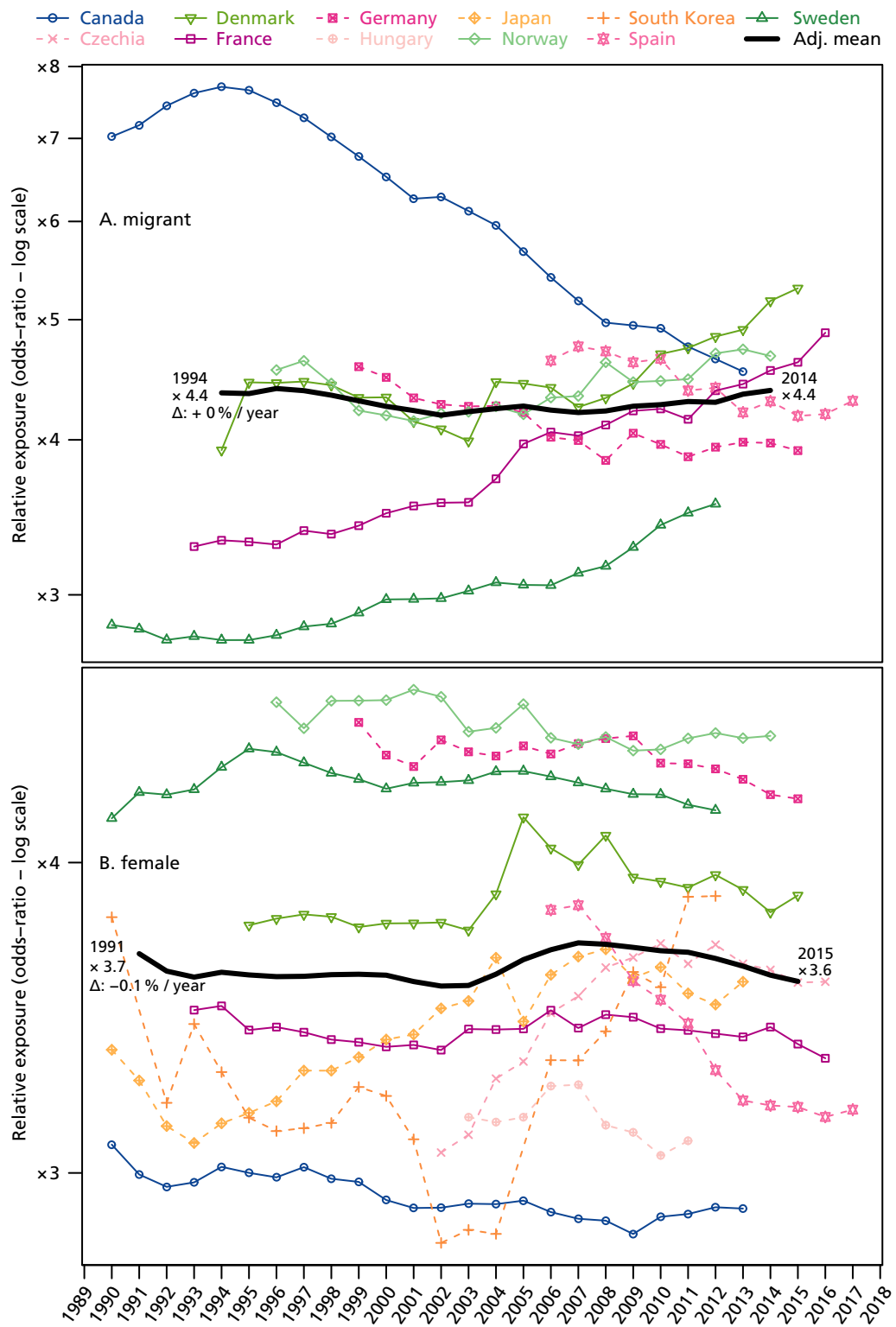
Gender. The degree of separation of male and female workers remains quite high (Figure 4B). On average, women are 3.6 times more exposed to female workers than male workers are. We find some contrasts between countries with higher gender workplace specialization (Sweden, Norway, Germany) and lower (Canada). However, in almost all countries the level of segregation remains stable. Only Czechia shows a trend towards growing workplace gender segregation and Spain a trend towards desegregation.

Age. We also explored age segregation in case our results reflected older workers' access to the top 1 and 10 % and increased age segregation across workplaces. Trends are quite heterogeneous across countries (Table 2 and Figure S6). Contrary to earnings segregation, we estimate a mild decrease on average of older workers (age > 55) isolation (-0.4 % per year). We do find a substantial increase in isolation, but mainly for younger workers and less pronounced than that found for top earners.

We also examine two dimensions more closely related to earnings: education and occupation.

Education. Since human capital is generally perceived as the main determinant of wages, we might suspect that growing earnings segregation is the result of growing education or skill segregation as implied by Kremer and Maskin (1996). Unfortunately, only Scandinavian countries, Germany, Hungary, Japan, and South Korea collect education data. Moreover, educational categories vary in time and are not fully comparable from one country to another. We therefore exploited the most comparable categorical distinction: tertiary education versus non-tertiary education. Table 2 and Figure S7 show that, overall, the relative isolation of tertiary educated employees is stable. The exceptions

Figure 4 Migrant and female relative workplace isolation



are trends towards a decline in isolation in Germany and an increase in isolation in Hungary. While data quality and coverage lead us to remain cautious, these results show that top earner separation is not mainly a phenomenon of sorting by educational skills.⁶

Occupation. In order to study segregation along the occupation dimension, we use a three-category comparison: managers and professionals to represent upper class occupations, blue collar and unskilled service workers as working-class employees (58 %), and intermediate workers as a semi-skilled intermediate class. The quality of occupation data is also questionable. The proportion of missing values for occupation is high in some countries, occupational schemes are heterogeneous from one country to another, and they sometimes change during the period.

We find a growing isolation of managers and professionals, especially in France, Denmark, and Czechia (Table 2 and Figure S8). The trend towards isolation of the working class is even more pronounced and more general throughout the set of countries (notably in Denmark, Spain, Czechia, South Korea, and France). On average, the isolation of this group increases by +2 % per year. Thus, occupational segregation increases strongly and is consistent with trends in earnings segregation and with recent increases in occupational segregation in the US (Handwerker 2020).

To summarize, the comparison of the evolution of earnings segregation with that of other forms underlines the specificity of the former. The increase in segregation is more pronounced and more general for earnings segregation than for any other dimension, leading at the end of the period to a level of separation between top earners and bottom earners much larger than between polar groups on other dimensions. The only other dimension that shows a similar trend across countries is the growing segregation between occupational classes.

7 The link between work and residential segregation

Growing separation between top and bottom earners at work is thus a strong, homogeneous, and important phenomenon reshaping propinquity in one of the major spheres of social life: work. Given the centrality of work, we suspect it relates to and even impacts other dimensions of social cohesion. In this final section, we will restrict this exploration to one dimension: residential income segregation, which has also been increasing

6 Nevertheless, when we delve deeper into detailed categories, we find a trend in line with rising separation between top and bottom earners: in all countries, except Germany, postgraduate levels are segregating from both bachelor and high-school levels (but not from primary education).

in recent decades, in many high-earning countries (Reardon and Bischoff 2011; Musterd et al. 2017). How are these two dimensions related? Is segregation at work fueling residential segregation? Or is it the other way around?

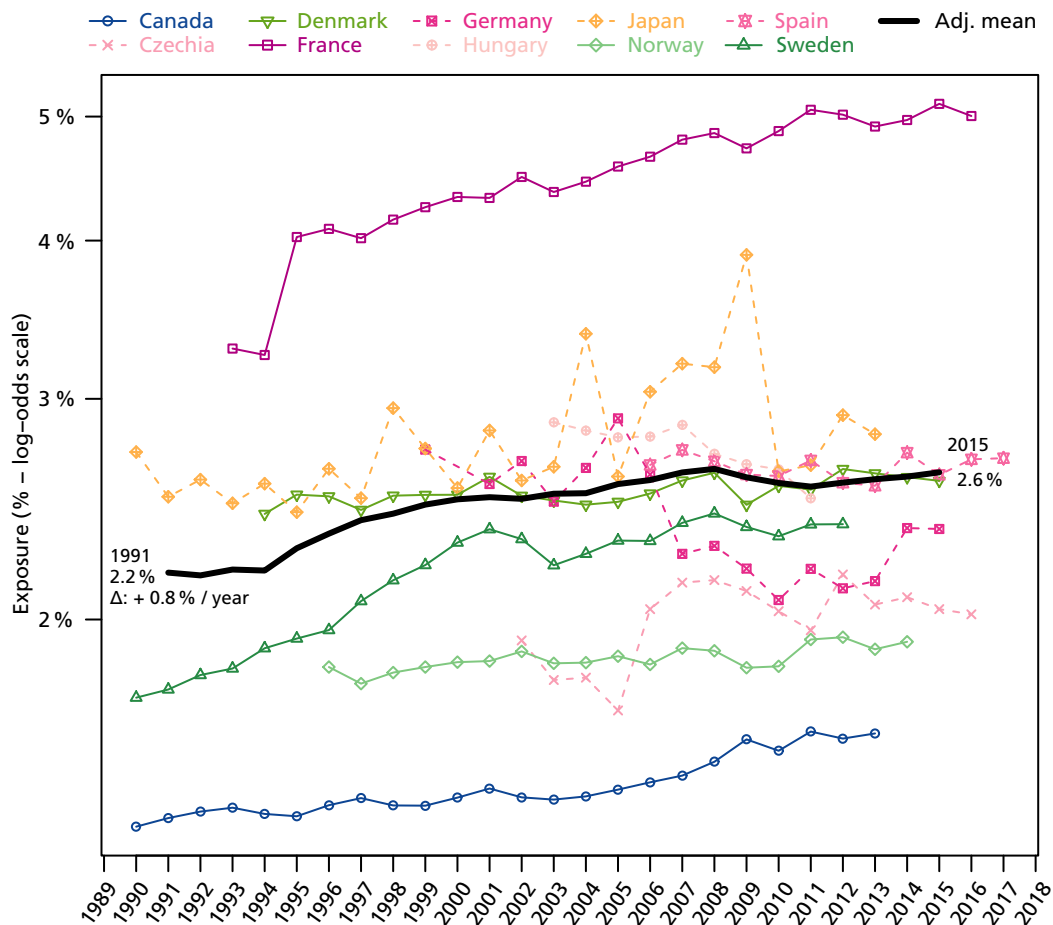
Causality could run in both directions. The workforce and location of establishments depend on the composition of the local labor market and hence the social structure of the surrounding residential areas. Therefore, if top earners cluster in the same type of towns and avoid propinquity with bottom earners in their neighborhood (Paugam et al. 2017), then establishments which hire these workers will tend to relocate or remain in these specific areas. Those already located there will also find it more difficult to hire middle or bottom earners as the latter are pushed away by the increase in real-estate costs. Conversely, establishments can modify the composition of the local labor market and therefore nearby residential areas (Cousin 2014). When hiring or laying off, they contribute to attracting new workers in the local area or pushing them to find jobs elsewhere. Moreover, firms' wage policies determine the type of earners and their probability of interaction. Indeed, the clustering of high-profile activities in a limited set of urban areas, or in special districts of those urban areas (such as tech in Silicon Valley or finance in New York, Paris, and Frankfurt), also impacts the probability of interaction in neighborhoods. Thus, if some establishments reorganize their labor and isolate top from bottom earners, this will lead to more residential isolation of top earners living in residential areas close to their establishments. If this is the case, then top earners' workplace segregation fuels the urban "great divergence" (Moretti 2012) and increases gaps between the large metropolis and the nation's "periphery" (Guilluy 2016). Recent papers already highlight the primacy of structural determinants. Consistently, Reardon and Bischoff (2011) document the causal impact of rising income inequality on increased income residential segregation. Scarpa (2015) also concludes that shifts in household income led to rising neighborhood segregation, rather than residential segregation leading to household income segregation, in Malmö, Sweden.

In order to measure residential segregation, we apply the same method as previously, with workers' municipality of residence as our unit of exposure (Figure 5).⁷ Our concept of residential segregation comes with several caveats. First, we reduce residential segregation to segregation between wage-earners only, excluding de facto many inhabitants from the measure (self-employed, unemployed and inactive persons). Second, the size and number of municipalities are very different from one country to another.⁸ Hence, we use 36,000 municipalities in France, whereas we have only 150 in Canada. The great-

7 In the Czech and Japanese data, we do not have the municipality of residence. We use the municipality of work (address of the establishment) instead.

8 Several discontinuities need to be considered. Following a consolidation of municipalities in Denmark, the number of municipalities drops from 311 to 99 in 2007. Similarly, in Japan, the number of municipalities drops from 2,800 to 1,800 in 2008. In French data, a discontinuity appears between 1994 and 1995. In 1993 and 1994, Marseille and Lyon were both counted as single municipalities. Thereafter, they are divided into 16 and 9 districts (*arrondissements*) respectively. Paris is divided into 20 districts throughout the period.

Figure 5 Top 1 % residential isolation



er granularity of French residential units enables superior measurement of spatial segregation. Not surprisingly, the level of top 1 % isolation is much larger in France than in Canada (for instance, in 2013, 5 % in France versus 1.6 % in Canada).

We find – as shown previously for the US (Reardon and Bischoff 2011), France (Godechot 2013), and European cities (Musterd et al. 2017) – an increasing economic residential segregation along the income and/or wage dimensions. The residential isolation (captured at the municipality level) of the top 1 % increased by a yearly rate of +0.8 % in Canada, +1.5 % in Sweden, and +1.8 % per year in France.⁹ This growing residential isolation is more due to an increased separation from mid quartiles than from bottom quartiles.

9 One could imagine that the magnitude of the French increase in segregation might be due to the high number of municipalities. In order to address this concern, we replicated this analysis with the 96 metropolitan departments as units of residential exposures. The level of segregation is indeed lower, but the rhythm of increase is very similar. Hence, top 1 % isolation moves from 2.0 % to 3.0 % between 1993 and 2015, growing at a yearly rate of +1.8 %.

Table 5 Dynamic link between establishment segregation and municipality segregation

	Residential segregation					
	top 1 % exposure to			top 10 % exposure to		
	top 1 %	F25-75	F00-25	top 10 %	F25-75	F00-25
Lagged dependent variable	0.18 (0.20)	0.44*** (0.14)	0.51*** (0.09)	0.34** (0.17)	0.57*** (0.10)	0.58*** (0.03)
Workplace segregation	0.34**			0.14*		
Top 1 or 10 % isolation	(0.13) [0.61**]			(0.08) [0.40*]		
		0.13***			0.055*	
Top 1 or 10 % to F25-75		(0.04) [0.42***]			(0.029) [0.19*]	
			0.014			0.006
Top 1 or 10 % to F00-25			(0.047) [0.066]			(0.037) [0.03]
Control variables	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes
N	167	167	167	167	167	167
	Workplace segregation					
	top 1 % exposure to			top 10 % exposure to		
	top 1 %	F25-75	F00-25	top 10 %	F25-75	F00-25
Lagged dependent variable	0.36*** (0.06)	0.63*** (0.10)	0.66*** (0.05)	0.65*** (0.10)	0.79*** (0.05)	0.71*** (0.06)
Residential segregation	0.52***			0.52***		
Top 1 or 10 % isolation	(0.07) [0.29***]			(0.14) [0.19***]		
		0.66***			0.42	
Top 1 or 10 % to F25-75		(0.22) [0.20***]			(0.31) [0.13]	
			-0.29			-0.57
Top 1 or 10 % to F00-25			(0.52) [-0.06]			(0.60) [-0.10]
Control variables	yes	yes	yes	yes	yes	yes
Year fixed effects	yes	yes	yes	yes	yes	yes
N	167	167	167	167	167	167

Note: Arellano-Bond GMM dynamic panel regressions. We instrument the lag dependent variable and the key independent variables with the three lags of those two variables. We use the logarithm of odds proportion for all exposure measures. Control variables include log number of establishments, log number of municipalities, log number of the working population (weighted), log number of workers (un-weighted), log of average wages.

Robust standard errors in parentheses. Standardized estimates in square brackets (with the within country standard deviation).

*** p<0.01, ** p<0.05, * p<0.1

Indicators of work and residential segregation are correlated both at the individual level and national level (Table S4). In Table 5, we try to evaluate the respective impact of these two mechanisms at a national level, for our panel of ten countries during a period of seven to twenty-four years. For this purpose, we estimate an Arellano-Bond (1991) dynamic panel GMM regression model. This first-difference panel model accounts for reverse causality through the introduction of a lagged dependent variable. It avoids the temporal bias of OLS estimations through the instrumentation of the endogenous first-differenced variables with their past lags. Here, we use the three first lags as instrumental variables. Hence the model is the following:

$$\Delta y_t = a.\Delta y_{t-1}^* + b.\Delta x_t^* + c.\Delta z + t + u \quad (6)$$

where t is a yearly fixed effect, u is a random error term, z represents control variables, and Δy_{t-1}^* and Δx_t^* are instrumented with $y_{t-2}, y_{t-3}, y_{t-4}$ and $x_{t-1}, x_{t-2}, x_{t-3}$.

Table 5 shows that the link between work and residential isolation goes in both directions. For instance, if the establishment top 1 % isolation index increases by a magnitude of 1 percentage point, the residential top 1 % isolation increases significantly by a magnitude of 0.3 percentage point. Conversely, a one percentage point increase in top 1 % residential isolation also translates into a significant increase in establishment segregation. We find similarly a bidirectional causality link between residential and establishment exposure of top 1 % or 10 % to mid quartiles. Top 1 % or 10 % exposures to bottom quartiles in town and at work seem unrelated.

Second, in order to evaluate the respective impact of establishment and residential segregation on one another, we standardize the estimates with the within-country standard deviation of each variable. When top 1 % workplace isolation increases by one standard deviation, residential segregation increases by 0.6 standard deviation. Conversely, one standard deviation more residential isolation only produces a 0.3 standard deviation in workplace isolation. Results are attenuated in both directions with top 10 % earnings group. Nevertheless, the method shows that in those last cases the impact of workplace segregation on residential segregation also remains twice as large as the impact of residential patterns on workplace segregation.

Therefore, these models allow us to conclude that the correlation between workplace and residential segregation owes much more to the impact of workplace on residence. Hence, in some contrast to literature on urban segregation, which implicitly blames the rich for deliberately avoiding the poor for schooling, status, and security reasons, our results suggest that the increasing residential isolation of the rich is also due to structural factors relating to the socio-spatial organization of economic activity.

8 Elements for a research program on the causes and consequences of increasing segregation at work

This paper's main contribution is to solidly establish a stylized fact: a strong trend in multiple countries towards the isolation of top earners at work and, as a consequence, in town. Top earners not only get a larger fraction of the wage bill (Piketty 2014), they also remain more and more among themselves and do not mix with other workers. This important trend calls for a strong research program on the causes and consequences of growing separation in social life. In this final section, we will suggest some potential themes for this research program.

The roots of growing earnings segregation at work

In order to explain increased segregation between workplaces, classical factors of work transformation, such as changing divisions of labor, technological progress, or globalization, stand as classical explanations. Future research will also have to explore the role of two other factors; namely, the reorganization of firm boundaries and the decline of workers' power.

Technological progress. During the last few decades, and especially with the computerization of production, technological progress has become a major factor of work reorganization. It has led to some jobs disappearing and with them possibly also daily interactions between various levels of the pay scale. For instance, before the personal computer revolution of the 1980s, (male) line managers could count on the daily support at work of a (female) personal secretary who would type reports and letters and take charge of workplace information coordination and social life (including making coffee). As the personal computer became a daily tool, managers learned to type and manage their own information flows. As a consequence, secretarial jobs were either shared among a large set of line managers or disappeared, taking with them these gendered top earner-bottom earner interactions (Le Ru 2011). With the concept of job polarization, previous research insisted on the impact of job disappearance on wage inequality (Autor, Katz, and Kearney 2006). On the one hand, unskilled routine jobs are the most at risk of being replaced by computers and robots. On the other, both unskilled non-routine jobs (like cleaning and care jobs) and skilled non-routine jobs (like engineering and expertise) are barely impacted by technological displacement. This asymmetric technological advance decreased the number of jobs at the middle of the wage hierarchy and increased the number of jobs at both ends in at least some countries (Fernández-Macías, Hurley, and Storrie 2012). This literature, however, has yet to focus on the impact of such transformation on the job homogeneity of workplaces. It is quite likely that technological progress led to a simplification of the division of labor and enabled some firms and establishments to concentrate on design tasks, which require mainly skilled non-routine jobs, without a strong need for the support of unskilled workers. Card,

Heining, and Kline (2013), operating in the wage variance decomposition tradition, did find for Germany that rising between-workplace wage inequality was strongly tied to occupational reconfigurations, but they did not test the job polarization thesis directly.

Globalization. With neo-liberal economic institutions (GATT, EU, NAFTA, etc.) and policies supporting free trade, and with the decrease in transportation costs, western firms (first in manufacturing and now in services) exploit the international difference in labor costs to organize production. This has led to the relocation of routine production to countries where labor is abundant and cheap. While skilled labor is scarce in developing countries, unskilled labor is notably abundant, leading to a strong process of relocation of unskilled tasks. This globalization process has similar consequences to the technological progress mentioned above, but through a different mechanism (Alderson 1999; Kollmeyer 2009). Rather than disappearing with computerization, unskilled routine jobs are relocated to cheap labor countries. But the consequences of this shift are similar. It contributes to a greater homogeneity of workplaces, with managers and engineers remaining in the headquarters and the design bureaus of international firms. Indeed, Smith (2018) shows that positive exogenous export shocks in Germany increase the sorting of productive workers into productive firms by 14 %. However, we still do not know if this effect is mainly due to international firms organizing production on a global basis or also to small local firms producing for the international market. Moreover, the impact of importation (and thus of low-wage country competition) is difficult to properly proxy and fully assess.

De-diversification and outsourcing. Even without technological progress or globalization, firms could reorganize their activity in a way which increases segregation at work. Hence, with the shareholder revolution, firms moved away from the multidivisional conglomerate form, where maximizing firm size was a primary goal and diversifying activities one of its techniques. In contrast, in order to fully maximize shareholder value (rather than size), the new paradigm supported firms' de-diversification and concentration on core activities (Jung and Dobbin 2015; Davis 2016). Financial analysts were among the principal promoters of such moves, as this could make the monitoring of firms' activities more in line with their own specialization (Zuckerman 1999). Concentrating on core activities not only means breaking gigantic conglomerates into separate entities but also, within each establishment, outsourcing all activities that are considered non-core. For instance, in most large US firms, food, cleaning, security, and logistics workers, formerly core firm employees, are now outsourced and provided by large low-wage service firms (Weil 2014; Song et al. 2019). In Germany, Goldschmidt and Schmieder (2017) establish that the share among cleaning workers of those employed in cleaning firms moved from 10 % in 1975 to 40 % in 2008. During the same period, the share of retail establishments hiring at least one cleaning worker declined from 82 % to 20 %. They identify outsourcing as one of the major drivers of this shift, leading to a 10 % wage drop for outsourced workers compared to similar non-outsourced workers. In short, outsourcing enables firms' wage rents to be shared only among non-outsourced workers.

One could object that in such cases it is only contractual similarity between top earners and bottom earners which declines and that real propinquity at work remains unchanged. However, outsourcing does also change the nature of propinquity. First, belonging or not belonging to the same firm enables one, or not, to make claims on pay and working conditions. When top earners do not belong to the same firm, they have little influence on conditions for the bottom earners and claims-making becomes useless. Second, such outsourced workers have a different relationship to the workers they serve from the relationship they had when they belonged to the same firm. Their new employer makes them invisible: it turns them from employees to input costs, puts the logo of the subcontractor on their shirt, shifts them from one customer to another, and asks them to work at night and/or unstable hours, shrinking considerably the possibility of socially authentic interactions with local employees (Brody 2006).

Before the shareholder revolution, firms were classically thought of as a legal entity with a clear hierarchy. They are now viewed as a nexus of contracts, an intermediary form between market and hierarchy (Williamson 1985), linking long chains of customer-supplier relations (Davis 2016). This type of organization affects not only periphery services but also core production activities. It thus contributes to the legal and physical separation of workers from different occupations and levels of the pay scale. Moreover, as shown by Wilmers (2018), this type of organization enables new forms of exploitation between buyers and suppliers and therefore increases wage segregation as a result. When a supplier serves a limited set of customers, its business remains at the mercy of buyers who can threaten to sever the contract in exchange for better terms. As a consequence, wages are lower among the most dependent suppliers. This power asymmetry between superstar firms and dominated suppliers further increases earnings segregation between workplaces.

Workers' declining power. The moderating influence of workers' bargaining power in general and of unions more specifically on inequality is well known (Kristal 2010; Card, Lemieux, and Riddell 2018). Similarly, the role of unions in gender and racial segregation at work is a domain of ongoing research with mixed evidence (Reskin 1993; Ferguson 2015). However, little is known about the impact of workers' power on wage segregation. Kramarz (2007) develops a framework in which unions are the causes of outsourcing. Firms adopt outsourcing as a strategy in order to reduce the quasi-rent workers enjoy thanks to unions. Indeed, outsourcing (and also relocation) is a way to bypass workers' access to firm-based welfare benefits. But it is not so much the existence of unions per se which incentivizes firms to outsource as the correlated effect (the welfare benefits) and the fact that those benefits are narrowly defined. Hence, in countries where benefits are firm-based (like in the United States) or defined through narrow-coverage collective agreements, there are more incentives to outsource than in countries where workers have large-coverage (or even national) collective agreements. Moreover, unions could also act as a counterbalancing force as they fight against such strategies and often mobilize against outsourcing and relocations. Hence, Tomaskovic-Devey et al. (2020) show that between-workplace inequality grew more in countries where institutional protection at work declined.

The consequences of growing earnings segregation at work

Decline in social mixing. We have demonstrated that the decline in socioeconomic proximity at work contributes to rising socioeconomic residential segregation. Future research will need to measure how it contributes beyond that to declining social mixing and social mobility, either directly or through the residential channel.

Through internal promotions and vacancy chains (White 1970), large firms were once the locus of career opportunities, enabling some workers to climb the social ladder. The decline of internal labor markets and the increased use of external labor markets to fill vacancies are often said to reduce upward social mobility. The increased homogeneity of top earners' work environment is potentially another reason. Because low earners no longer work in the same firms as top earners, they will have little chance of being promoted to a top earner position.

Work is also an information processor. Employees learn from their co-workers about opportunities on many issues, such as jobs, but also on the quality of their environment, such as neighborhoods or schools. In a context of increased work segregation, low earners will not access the richer set of information the upper class enjoy (Lin 2002). Moreover, top earners may not only hoard opportunity in favor of similar others, growing endogamy at work might also make them more sensitive to status competition when it comes to the choice of their environments. Advised by similar others, they will be more inclined to avoid supposedly bad or mediocre workplaces, neighborhoods, or schools, and reinforce segregation in all settings.

Finally, growing segregation at work impacts social mixing and social mobility through its impact on residential and educational segregation: fewer top-bottom interactions in neighborhoods and growing homogeneity of schools and universities lead to growing mating endogamy at the top of the social hierarchy (Schwarz and Mare 2005; Bouchet-Valat 2014). Classical literature on social mobility has found that intergenerational social mobility is either stable (Goldthorpe and Erikson 1992) or increasing slowly (Vallet 2001). Similarly, analysis of intergenerational relative income mobility has long concluded in favor of stability (Chetty et al. 2014). However, increased segregation at work has occurred mainly during the last two decades. In two recent studies, Harding and Munk (2020) and Davis and Mazumder (2020) show a substantial decrease in intergenerational income mobility in Denmark and the United States. Moreover, the decline in social mixing seems to intersect with migrant-ethnic categories. Ci and Hou (2016) find that in Canada immigrant income mobility now occurs primarily by moving to higher-wage firms. For the US, Ferguson and Koning (2018) find rising between-firm racial segregation and speculate that it is tied to increasing between-firm wage polarization. The role of workplace earnings polarization in both inter- and intragenerational mobility are promising avenues for future research.

Increasing isolation and increasing inequality. As top earners are increasingly isolated from low earners, they come to work in a different economic setting. They are isolated not only from low earners but also from their norms, manners, and ways of thinking, and they build a different vision of what is a society and of who deserves what (Dubet 2015). Top earners are decreasingly exposed to the normative pressure coming from the bottom and the middle of the wage hierarchy regarding pay setting. At the same time, a homogenous top earner work environment could enhance status competition. For instance, in some finance firms where pay can be extremely high, traders see their bonuses not only as a market price but also as the symbolic value of their own person, for which they will fight with extreme tenacity (Godechot 2017b). Hence, a possible outcome of increased top earner isolation is an increase in inequality, with higher levels of pay for the top earners and a greater dispersion of pay among them and increasing neglect of the claims of lower-level workers. The same disregard for the claims of lower-level workers probably morally justifies outsourcing, the rise of independent contractors, and other forms of production fissuring (Weil 2014).

Beyond work, increased top earner isolation also changes the way elites engage with the rest of society and may have political consequences. Bartels (2008) showed that governments are more responsive to the preferences of the top 1 % than to the rest of society. The effect of the changing composition of politicians, increasingly coming from an upper-class background (with the declining role of workers' unions in politics) is amplified by the growing isolation of elites. Neither the politicians coming from elite backgrounds nor their acquaintances (family, friends) are exposed to the low earners and their subsequent needs at work or in neighborhoods. Except for those politicians opting deliberately for a populist strategy, promoting elitism, technocratism, and neo-liberalism may be the most coherent thing for a political elite (and more generally an elite) that is increasingly disconnected from the other social classes.

Changing representation of society and growing populism. Increasing segregation at work could transform not only the upper classes' views of society but also those of the rest of society. While elites disappear from their proximate environment, they are still observed via the media's obsession with their flashy lifestyle. Low earners know of the existence of top earners, but they hardly get to interact with them. This decoupling may affect the type of inferences they make on the cause of inequality.

When bottom earners interacted with top earners within the same establishment, as in Zola's *Germinal*, they could establish a link of mutual interdependence between high earners and low earnings. This interdependency could be colored either positively, as a trickle-down effect, where high earnings for employers and managers enable economic activity and employment, or negatively, as an exploitation mechanism, where low earnings for the many enable high earnings for a few (Boltanski and Chiapello 2005). However, in both cases, this mutual exposure could frame low earners' view of the world and fuel a sentiment that they at least count for something.

Conversely, with the disappearance of concrete exposure, recognizing mutual interdependence might vanish as well. In the absence of any concrete exposure and when different workplaces are linked through long chains of subsidiary relationships or complex buyer-seller contracts, it becomes more difficult to establish a causal relation between top earners and low earners. It would require the reconstitution of the complex relations between entities which seem at first sight independent. Knowing the existence of top earners from the press, seeing the top earners avoiding you, and being unable to establish a causal link between their high earnings and your low earnings could leave you with a different sentiment: that of counting for nothing and being despised. Hence, during recent class struggles in some countries, such as the yellow vest protest in France (Algan, Malgouyres, and Senik 2019) and before it the red cap protest in Brittany (Guiluy 2016), demonstrators did not blame their direct managers and employers (contrary to May 1968 protesters), nor did they pinpoint work relations and economic activity as being responsible for their poverty. They rather criticized the state and distant elites for a global lack of consideration.

These increased feelings of relative deprivation and of being left behind might, if confirmed, translate institutionally through reduced unionization (if work relations are no longer considered to be causal) and possibly through depoliticization (as shown by the growing political abstention) or the rise in right-wing populism. Hence, the recent geographical co-evolution of segregation and voting geography goes in this direction. In many countries, segregation at work and reorganization of economic activities fueled increased socioeconomic segregation between large wealthy metropolises, notably global cities, and deprived hinterlands. In recent elections in the UK (Brexit 2016), the US (2016 presidential election), and France (2017 presidential election), the vote became massively polarized between coastal states and inner states in the US, or between global capital cities (London, Paris) and the rest of the country. France provides a striking example: in 1988, Jean-Marie Le Pen, the right-wing populist leader, received the same vote in the Paris region (15.6 % of the votes) as elsewhere (14.4 %). Thirty years later, his daughter, Marine Le Pen faded in Paris (12.5 %) but doubled her fathers' vote elsewhere (27.0 %). It is quite tempting to relate this evolution to growing elite geographical isolation. In 1988, 70 % of the wage earners belonging to the national top 0.1 % worked in the Paris region (which accounts for only 28 % of all wage earners). In 2007, this proportion increased to 80 % (Godechot 2013).

In this paper, thanks to administrative linked employer-employee datasets covering eleven countries, we establish a new stylized fact. During the last twenty years, top earners and low earners work less and less in the same workplaces. This pattern is robust: it holds true when we change the definition of the wage or of the working unit, and it is not due to an industry or a geographical compositional effect. The evolution in segregation along different dimensions, notably gender and nativity, do not follow the same

pattern. This trend is not the side effect of increased geographical socioeconomic segregation. On the contrary, we have shown that it is primarily segregation at work which fuels residential segregation.

But this paper is only a first step. Now that we have established the facts, we must delve further into the causes and consequences. We have suggested several plausible causes for this evolution, including technological progress, globalization, de-diversification and outsourcing, and workers' declining power. Similarly, we have underlined possible consequences, such as a decline in social mixing and social mobility, increased elitism at the top fueling increased inequality, and growing frustration at the bottom possibly nourishing modern forms of populism. It is the role of future research to confirm or disconfirm this set of hypotheses, and possibly to provide alternative ones.

Appendices

A1 Data sources and sample definition

For all countries, we exclude very low yearly wages, which we interpret as corresponding to failed job matches and short-tenure temporary work and, more rarely, reporting errors. We set the earnings exclusion threshold at a low level in order to include most part-time workers in our main analysis. In countries where we have a minimum wage, we exclude person-job matches which reported earnings of less than half a yearly minimum. In countries without a minimum wage, we used half P10 of full-time workers or one-third of prime age P50 (Sweden) as inclusion thresholds.

Canada (1990–2013). Data were generated by Statistics Canada. The data are population-level and include all sectors and industries and employees. Statistics Canada provides firms' identification number but neither the establishment ID nor the precise geographical unit of the workplace (beyond the province). We therefore use the interaction of province and firm ID to proxy establishment.

We lack information on education and hourly wages.

Czechia (2002–2016). Data were taken from the Average Earnings Information System (ISPV) survey conducted by the private agency TREXIMA. The data consist of the entire population of public sector workplaces, plus a sample of private sector workplaces. The private sector sample consists of workplaces with at least 10 employees. A stratified sampling of private sector workplaces with 10–250 employees was taken based on the size of the workplace. All private sector workplaces with over 250 employees are included in the data. The data also spans all industries and sectors. In the end, the dataset covers 80 % of Czech workforce and 96 % of the workforce in establishments with 10 and more employees. Estimates are weighted to correspond to the complete workforce in establishments with 10 and more employees.

We produced no estimates on education and hourly wages. We have no information on workers' residence. We therefore used the municipality of the workplace as a proxy in order to approach residential segregation.

Denmark (1994–2015). The data consist of population-level observations of both private and public sector workplaces extracted from the labor market statistic register (Den Registerbaserede Arbejdsmarkedstatistik – RAS), and earnings from the job register IDAN. Demographics such as age, gender, and nativity come from the population register (Befolkningsregistret).

In order to drop marginal jobs, we exclude workers earning less than half P10 threshold of full-time workers. The wage data show a discontinuity in 2008: the introduction of the e-income register in 2008 increased substantially the number of marginal jobs in the register. In order to consistently select the working population, we matched the 2008 threshold on 2007 by applying a +18,000 DKK correction in 2008 and following years.

In 1994, establishment ID is not available and we use firm ID instead. Following a reform in municipalities in Denmark, the number of municipalities drops from 311 to 99 in 2007. Occupation nomenclature changes in 2009, leading to a drop in the proportion of intermediate occupations from 22 to 14 % and a subsequent increase of upper occupations from 20 to 30 %.

France (1993–2016). Our analyses use data from the DADS social security register (*Déclaration annuelle de données sociales*). Access to the DADS data was obtained through the CASD (*Centre d'accès sécurisé aux données*) dedicated to researchers authorized by the French *Comité du secret statistique*. The data consist of population-level observations of private sector workers, plus all hospital and local civil service workers. State civil servants are missing before 2009 and excluded in the following years for consistency.

We have no information on workers' education. We consider people born outside France as a good proxy for "immigrants." This variable is missing in 2011 and of poor quality between 2002 and 2004. We therefore completed it with information on other years through the construction of a pseudo panel (cf. Appendix A4).

Germany (1999–2015). Data come from a customized sample for the project "Dynamics of Organizational Earnings Inequality: Investigation within the Comparative Organizational Inequality International Network (COIN)" of the Integrated Employment Biographies Sample (IEBS) of the Federal Employment Agency. It covers roughly 5 % of the German working population and about 20,000 establishments, spanning the years 1999–2015. Estimates are weighted to correspond to the complete workforce.

Earnings not subject to social security because they are below the threshold for small-scale employment (e.g., newspaper delivery), which is currently 450 euros per month, are excluded from the sample. The earnings are also top coded at the social contribution limit, which differs by year and for East and West Germany. To impute the top-coded earnings, an imputation strategy based on the imputation from Card, Heining, and Kline (2013) was established, which accounts for individual and establishment wage prior to the censored period. However, rather than focusing on the mean individual and establishment wage prior to the censored observation as was done by Card, Heining, and Kline, we utilize information on lagged earnings. Given the limitation of our imputation, measures of exposure involving the top 1 % should be therefore considered cautiously.

In the German data, we find a strong discontinuity in 2011 in education categories and occupation categories, leading us to drop the years after 2010 for studying segregation along those dimensions. While we have establishment IDs, firm IDs are lacking. Similarly, we have no hourly wages.

Hungary (2003–2011). Our analyses use Admin2 data processed by the Institute of Economics, Centre for Economics and Regional Studies of the Hungarian Academy of Sciences. These data are generated by linking data from five governmental institutions (the Pension Directorate, the Tax Office, the Health Insurance Fund, the Office of Education, and the Public Employment Service). The data are a 50 % random sample of the Hungarian population followed from 2003 to 2011. The earnings concept is monthly earnings from each person's primary job. Monthly data were aggregated to obtain yearly wages. Low-wage workers, defined as workers earning less than half of the yearly minimum wage, are dropped from the sample.

In the Hungarian data, we lack establishment ID and establishment geographical unit. We used firm IDs instead. The residential municipality of workers is known only for 2003. Therefore, when workers moved, we are unable to observe the new residential unit. Around 5–7 % of the population moved in the given period.

Japan (1989–2013). Data are from the Basic Survey on Wage Structure conducted by the Ministry of Health, Labor, and Welfare of Japan. The survey is a two-stage design in which a sample of private sector establishments with at least five employees are selected, and then a uniform random sampling of workers among these establishments is taken. Firms' executives are not included in the data. Given this limitation and the small size of the sample, measures of exposure involving the top 1 % should be therefore considered cautiously, but 10 % thresholds are treated as more reliable. The sample covers 4 % of the workforce working in establishment with more than five workers. Estimates are weighted to correspond to the complete workforce.

In the Japanese data, we lack information on nativity. We have the establishment IDs, but not the firm. We do not have the workers' residential unit. We therefore used the establishment geographical unit as a proxy.

Norway (1996–2014). Data were generated by Statistics Norway and are population-level, including all sectors and industries, although private sector identifiers are only available beginning in 1999.

Occupations are not available in this dataset.

South Korea (1982–2012). Data are from a survey conducted by the Korean Ministry of Labor. The data consists of a sample of private sector establishments, first stratified by size and then by region and industry. An establishment must have had a minimum of

five employees to be included in the sample before 1999, and ten employees beginning in 1999. All industries except agriculture are included. The dataset contains only full-time jobs. Estimates are weighted to produce national estimates.

The data does not provide information on nativity and residential areas. Changes in occupational nomenclatures led us to limit estimation of occupational segregation to the 1993–2007 period.

Spain (2006–2017). Our analyses use data from the Continuous Sample of Working Histories (CSWH) (*Muestra Continua de Vidas Laborales con datos fiscales*) from Spain's Social Security Office. The CSWH contains matched anonymized social security, income tax and census records for a 4 % non-stratified random sample of the population who in one specific year had any connection with Spain's social security system (whether via employment, self-employment, unemployment, or retirement). The CSWH provides information on individuals' complete labor market histories from 1980 (or the year the individual registers with Social Security) to the year of data collection.

Because earnings from the social security records are top and bottom capped, we use earnings from tax records containing uncensored gross labor earnings for each job (tax records are available from 2006 onwards). Thus, the procedure is as follows: first, we identify personal information from social security records then match those records with the individuals in the tax dataset, thereby obtaining 2006–2017 earnings from tax records. Consequently, we use the full information on the labor market history of individuals to compute their tenure and other variables but study earnings only for the years 2006 to 2017, for which tax data are available. When multiple jobs overlap, we only consider the main job, which is either that with the longest spell within the same firm or that with the highest earnings across firms. In this way, we build a yearly panel that covers job spells, with a start/end date and tied to a firm identifier.

Sweden (1990–2012). The data used are from population-wide administrative registers from Statistics Sweden (the LISA database) and cover all sectors and industries. However, occupations are only available after 2001 and hourly wages are not available.

A2 Demonstration of the symmetry of relative exposure ${}_gR_h = {}_hR_g$

We want to show that ${}_gR_h = {}_hR_g$

$${}_gR_h = \frac{\frac{{}_gP_h}{1-{}_gP_h}}{\frac{{}_{-g}P_h}{1-{}_{-g}P_h}}$$

with

$${}_gP_h = \sum_i \left(\frac{n_{gi}}{n_g} \right) \cdot \left(\frac{n_{hi} - 1_{h=g}}{n_i - 1} \right)$$

Remarkable properties

When $g \neq h$, ${}_gP_h$ can be expressed as a function of $w_{g,h}$ with $w_{g,h}$ symmetrical in h and g (i. e. $w_{g,h} = w_{h,g}$).

$${}_gP_h = \frac{w_{g,h}}{n_g}$$

$$w_{g,h} = \sum_i \left(\frac{n_{gi}n_{hi}}{n_i - 1} \right) = w_{h,g}$$

Moreover,

$${}_gP_h = \left(\frac{n_h}{n_g} \right) {}_hP_g$$

and, as shown by Bell (1954),

$$\sum_j {}_gP_j = 1$$

First, let us look at some properties of ${}_{-g}P_h$

$${}_{-g}P_h = \frac{n_h}{n_{-g}} {}_hP_{-g}$$

$${}_{-g}P_h = \frac{n_h}{n - n_g} \sum_{j \neq g} {}_hP_j$$

$${}_{-g}P_h = \frac{n_h}{n - n_g} (1 - {}_hP_g)$$

$${}_{-g}P_h = \frac{n_h}{n - n_g} - \frac{w_{g,h}}{n - n_g}$$

Now, let us express the odds ratio as a function of $w_{g,h}$

$$\begin{aligned}
 {}_gR_h &= \frac{{}_gP_h}{1-{}_gP_h} \times \frac{1-{}_gP_h}{-{}_gP_h} \\
 {}_gR_h &= \frac{\frac{w_{g,h}}{n_g}}{1 - \frac{w_{g,h}}{n_g}} \times \frac{1 - \frac{n_h - w_{g,h}}{n - n_g}}{\frac{n_h - w_{g,h}}{n - n_g}} \\
 {}_gR_h &= \frac{w_{g,h} \times (n - n_g - n_h + w_{g,h})}{(n_g - w_{g,h}) \times (n_h - w_{g,h})}, \text{ which is symmetrical in } g \text{ and } h.
 \end{aligned}$$

Therefore ${}_gR_h = {}_hR_g$.

A3 Figure construction

Adjusted mean

Our adjusted mean is an average of the country evolutions on a constant perimeter. In order to calculate this adjusted mean, we proceed as follows.

- 1) We interpolate linearly country series for missing years between the starting date and the end date.
- 2) We calculate the three-year moving average for all country series in order to avoid capturing short-term bumps due to inconsistencies in data collection.
- 3) We finally average this modified data:
 - 3.1. When the number of countries is complete:

$$\overline{X}_t = \sum_i \frac{X_{it}}{n}, \text{ where } X_{it} \text{ represents series } X \text{ for country } i \text{ and year } t.$$

- 3.2. When the number of countries is no longer complete:

$$\overline{X}_t = \overline{X}_{t-1} + \sum_i \frac{\Delta X_{it}}{n}$$

Where $\Delta X_{it} = X_{it} - X_{it-1}$

- 3.3. When the number of countries is not yet complete:

$$\overline{X}_t = \overline{X}_{t+1} - \sum_i \frac{\Delta X_{it+1}}{n}$$

This adjusted mean is calculated only when series are available for at least three country series for the year t .

Scale

We adapt the scale to display evolutions that are visually in line with the metrics used to measure them.

Log-odds scale for proportions

The “log-odds scale” is a scale for representing proportions p where vertical visual distances on the graphs are proportional to the log odds of the given proportions $\log(p/1-p)$. For instance, with such scale, visual distance on the graph between 4.74 % (whose log-odds is -3) and 7.59 % (log-odds: -2.5) will be similar to the visual distance between 37.75 % (log-odds: -0.5) and 50 % (log-odds: 0), or to the distance between 92.41 % (log-odds: 2.5) and 95.26 % (log-odds: 3).

Log scale for odds ratios

When we represent evolutions in relative exposure (expressed as an odds ratio), we adopt the classical log scale which gives the visual intuition of the multiplicative dimension of this measure.

Figure S3

Figure S3 displays for each country separately the yearly rate of evolution of the exposure of wage deciles to each other. To avoid capturing bumps due to inconsistencies in data collection, these rates of evolution were calculated on three-year moving averages. Hence, for France, D10’s exposure to D1 declined by -2.44 % per year (bottom left corner). We circle in black points measuring the evolution of isolation (exposure to one’s own group), such as D1 to D1, D2 to D2, etc.

A4 French robustness checks

French DADS pseudo panel, AKM fixed effects models

The French DADS is not proper panel data as the individual IDs (starting in 2002) are different from one yearfile to another. However, each yearfile y contains information both on the current year t and the preceding year $t-1$. We therefore take advantage of this overlap to build a pseudo panel based on common information (establishment ID, gender, number of hours, duration of the job, start and end dates of the job, municipality of work and residence, earnings and age) between year t of yearfile $y-1$ and year $t-1$ of yearfile y . We can successfully perform a single match with 98 % of the individuals. The pseudo panel therefore allows us to perform individual fixed effects and AKM models in order to estimate in Figure A4 evolutions of exposure based on fractiles of individual fixed effects.

Following Abowd, Kramarz, and Margolis (1999), Card, Heining, and Kline (2013), and Song et al. (2019), we estimate on five-year periods:

$$\log(y) = t_{FE} + e_{FE} + i_{FE} + u,$$

with y : yearly earnings, t_{FE} : year fixed effects, e_{FE} : establishment fixed effects, i_{FE} : worker fixed effects, and u : residual.

We estimate this equation on the largest set of workers and establishments connected by at least one establishment and one worker respectively. This connected set comprises 90.2 % of the workers during the period 2002–2006; 89.6 % for the period 2007–2011 and 87.7 % for the period 2012–2016.

Based on the estimation of the workers fixed effects i_{FE} , we compute national fractile groups (i.e. top 10 %, bottom 25 %) similar to those estimated throughout the paper, and we further estimate the exposure of those earnings groups to one another in the same establishment.

For comparison purposes, we also estimate on the same connected set the classical individual fixed effects (without controlling for establishment fixed effects). This enables us to estimate earnings segregation based on the average five-year earnings:

$$\log(y) = t_{FE} + i_{FE} + u$$

We also estimate the classical earnings exposure based on yearly earnings.

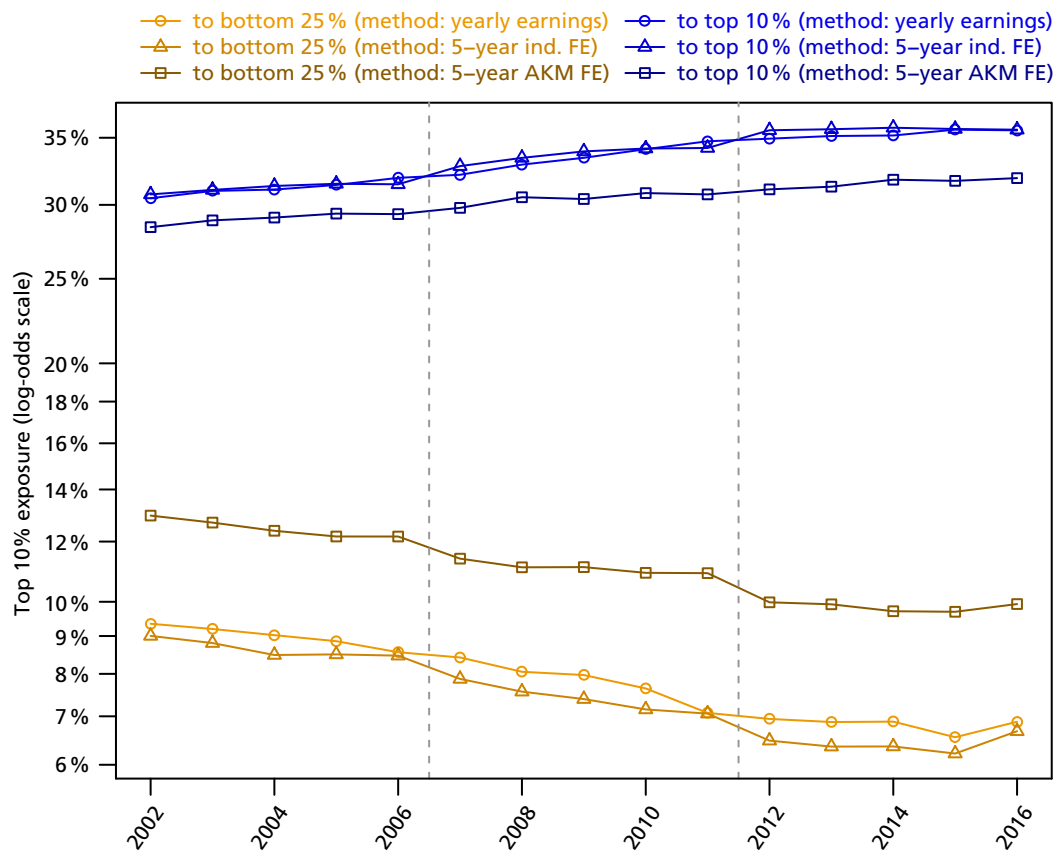
Supplementary figures and tables

Table A4 Contribution of detailed regions, industry, and establishment to workplace segregation in France

	Top 10 % isolation	Exposure to bottom 25 %
Descriptives		
1994	27.00 %	19.47 %
2016	36.13 %	6.71 %
Estimate of the linear time trend $y = b.t + FE + u$		
M1. no fixed effects (FE)	0.47 %	−0.20 %
M2. département fixed effects (n=98)	0.43 %	−0.18 %
M3. industry fixed effects (n=735)	0.32 %	−0.15 %
M4. establishment fixed effects (n=0.98 M)	0.20 %	−0.08 %
Decrease in the linear time trend:		
from M1 to M2	−9 %	−8 %
from M1 to M3	−33 %	−22 %
from M1 to M4	−57 %	−61 %
Number of observations	29,976,529	29,976,529

Note: In France, top 10 % isolation moved from 27 % to 36 %, increasing by +0.47 percentage point per year. When introducing département fixed effects, the linear trend drops from +0.47 to +0.43 percentage point (i.e. a −9 % drop).

Figure A4 Exposure with yearly earnings, five-year individual and AKM fixed effects



Note: In France, in 2002, top 10 % highest AKM individual fixed-effect employees have 28 % of their coworkers belonging to this earning group.
 Sources and methods: Appendices A1 and A4.

Figure S1 Confidence intervals for Figure 1

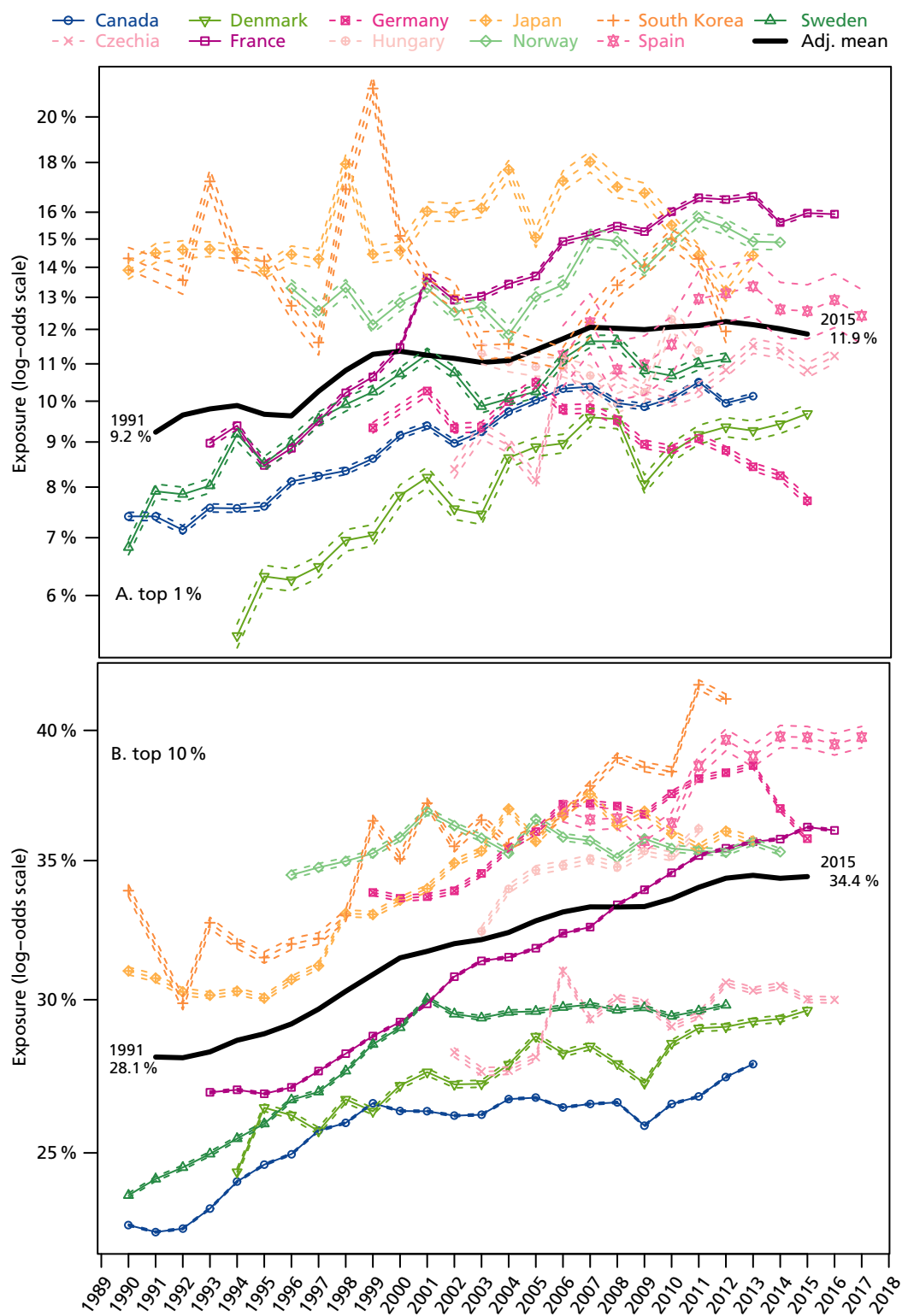


Figure S2 Top earner exposure to mid quartiles

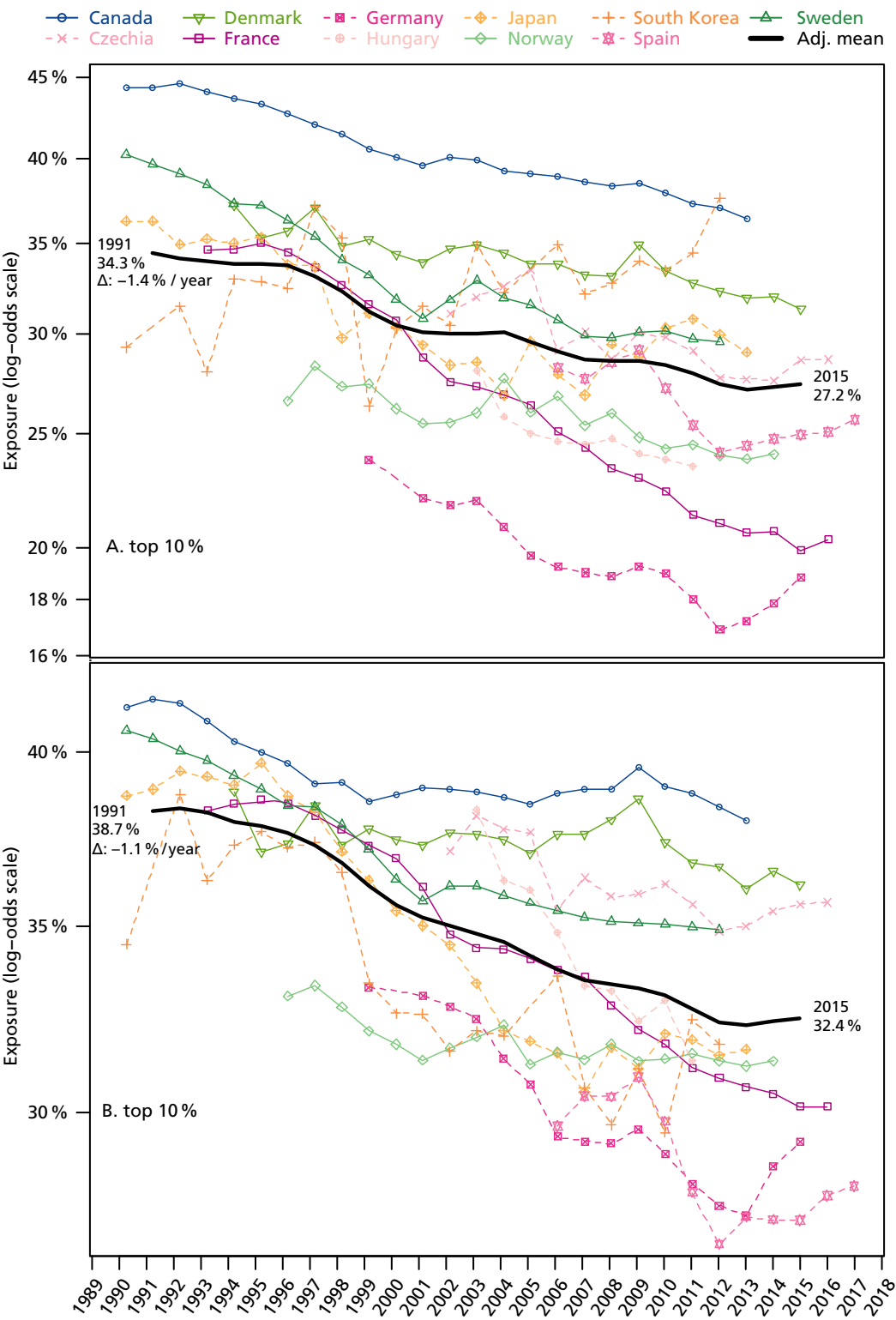
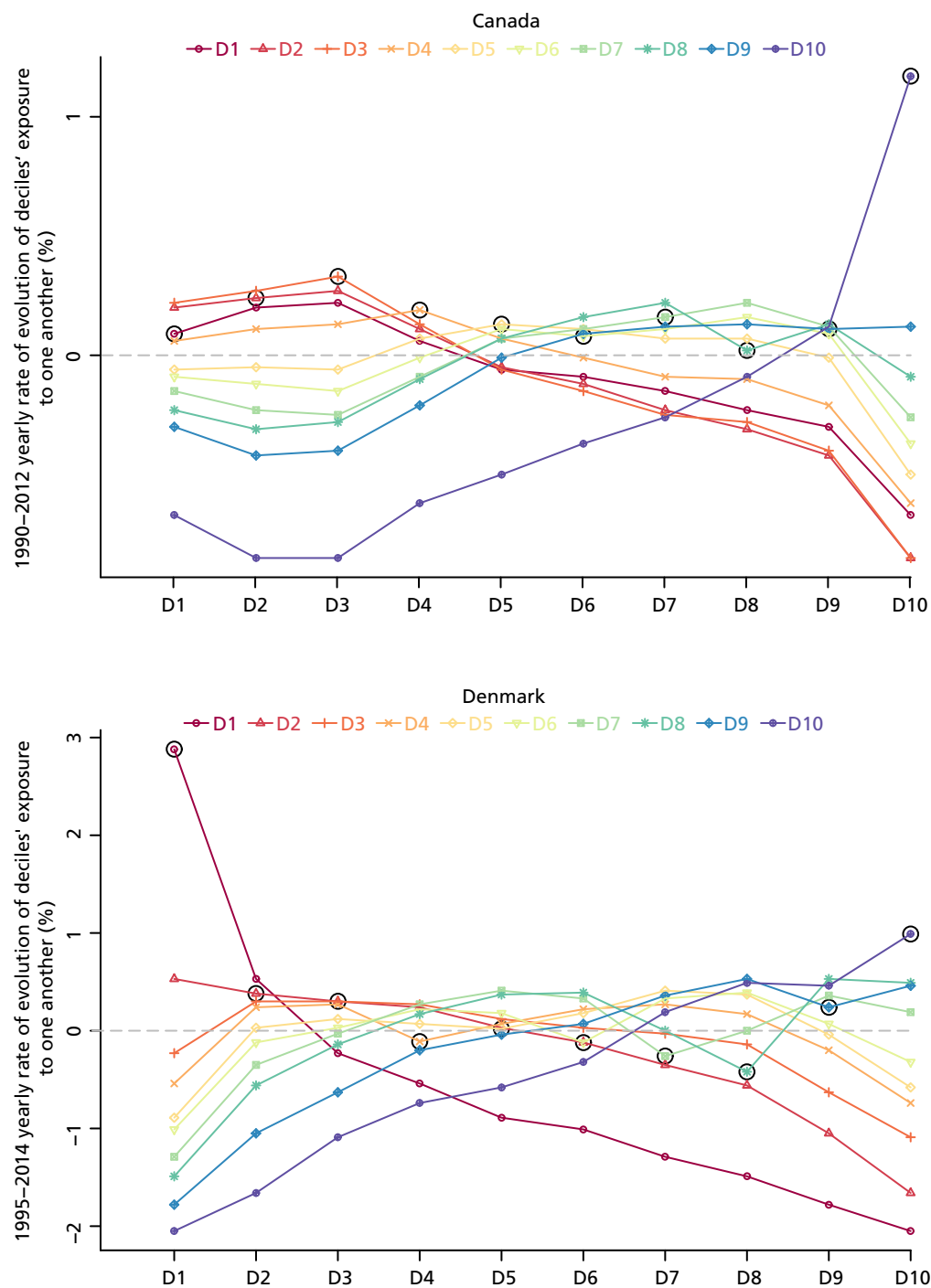


Figure S3 Yearly rate of evolution of each decile exposure to one another



Norway

1997–2014 yearly rate of evolution of deciles' exposure to one another (%)

Legend: D1 (red circle), D2 (red triangle), D3 (red plus), D4 (orange cross), D5 (yellow diamond), D6 (green inverted triangle), D7 (green square), D8 (green asterisk), D9 (blue diamond), D10 (purple circle)

Decile	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
1997	1.5	0.3	-0.5	-0.8	-0.8	-0.2	-0.1	-0.3	-0.9	-0.7
2002	0.5	0.5	0.0	-0.2	-0.3	-0.1	0.1	-0.1	-0.7	-0.9
2007	0.3	0.0	0.3	0.3	0.3	0.3	0.3	0.3	-0.2	-0.6
2012	-0.8	-0.7	-0.1	-0.5	-0.5	-0.2	-0.2	0.0	0.8	0.2

Sweden

1991–2011 yearly rate of evolution of deciles' exposure to one another (%)

Legend: D1 (red circle), D2 (red triangle), D3 (red plus), D4 (orange cross), D5 (yellow diamond), D6 (green inverted triangle), D7 (green square), D8 (green asterisk), D9 (blue diamond), D10 (purple circle)

Decile	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
1991	0.8	0.6	0.2	-0.2	-0.2	-0.1	-0.2	-0.3	-1.1	-1.5
1996	0.5	0.4	0.2	0.0	0.0	-0.1	-0.2	-0.3	-1.1	-1.6
2001	0.3	0.2	0.3	0.1	0.1	0.0	0.0	-0.1	-0.8	-1.6
2006	-0.3	0.1	0.1	0.3	0.2	0.1	0.1	0.0	-0.2	-1.2
2011	-1.5	-1.5	-1.2	-1.3	-1.2	-0.9	-0.3	0.3	1.2	1.5

Figure S3 continued

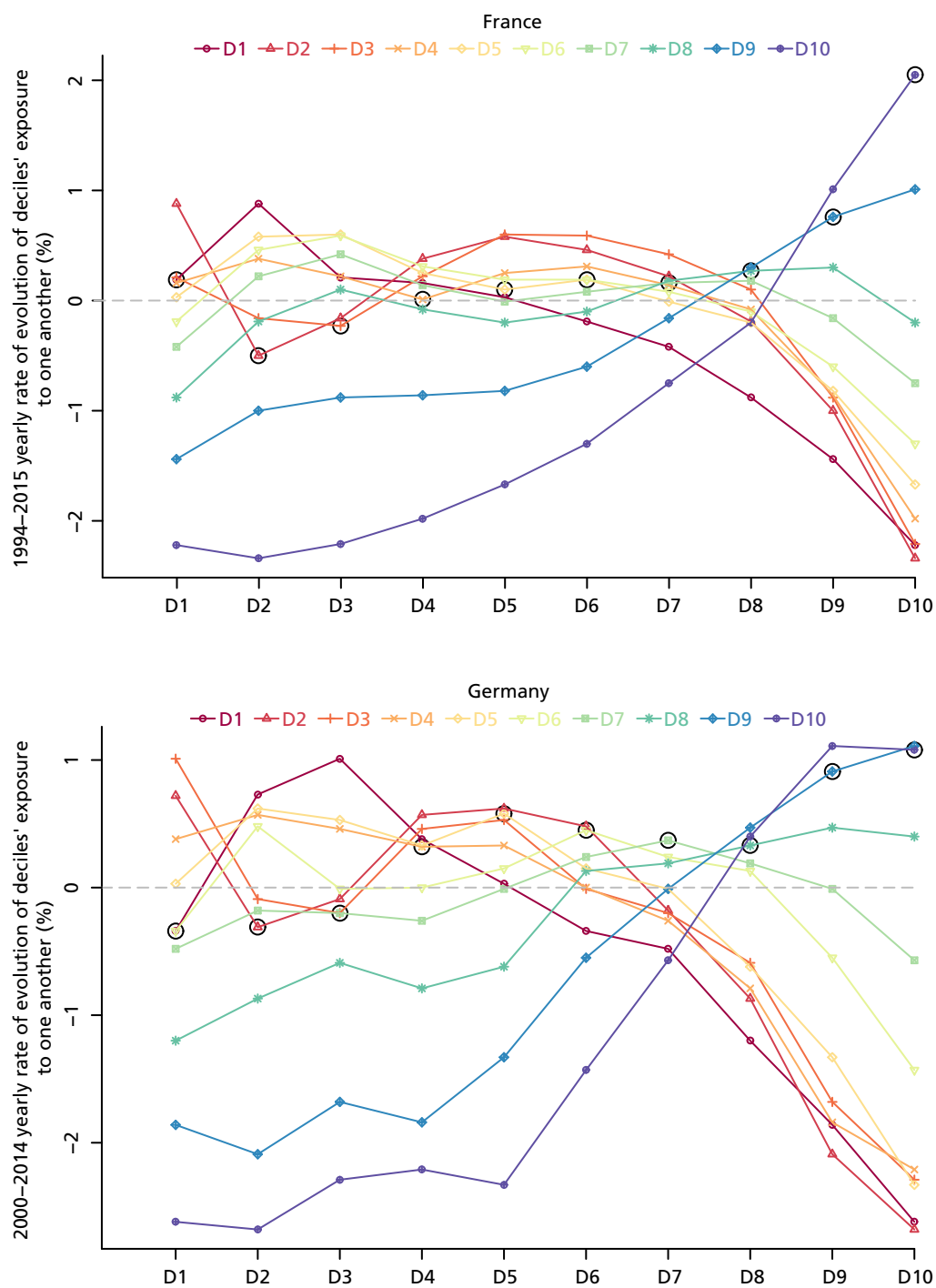


Figure S3 continued

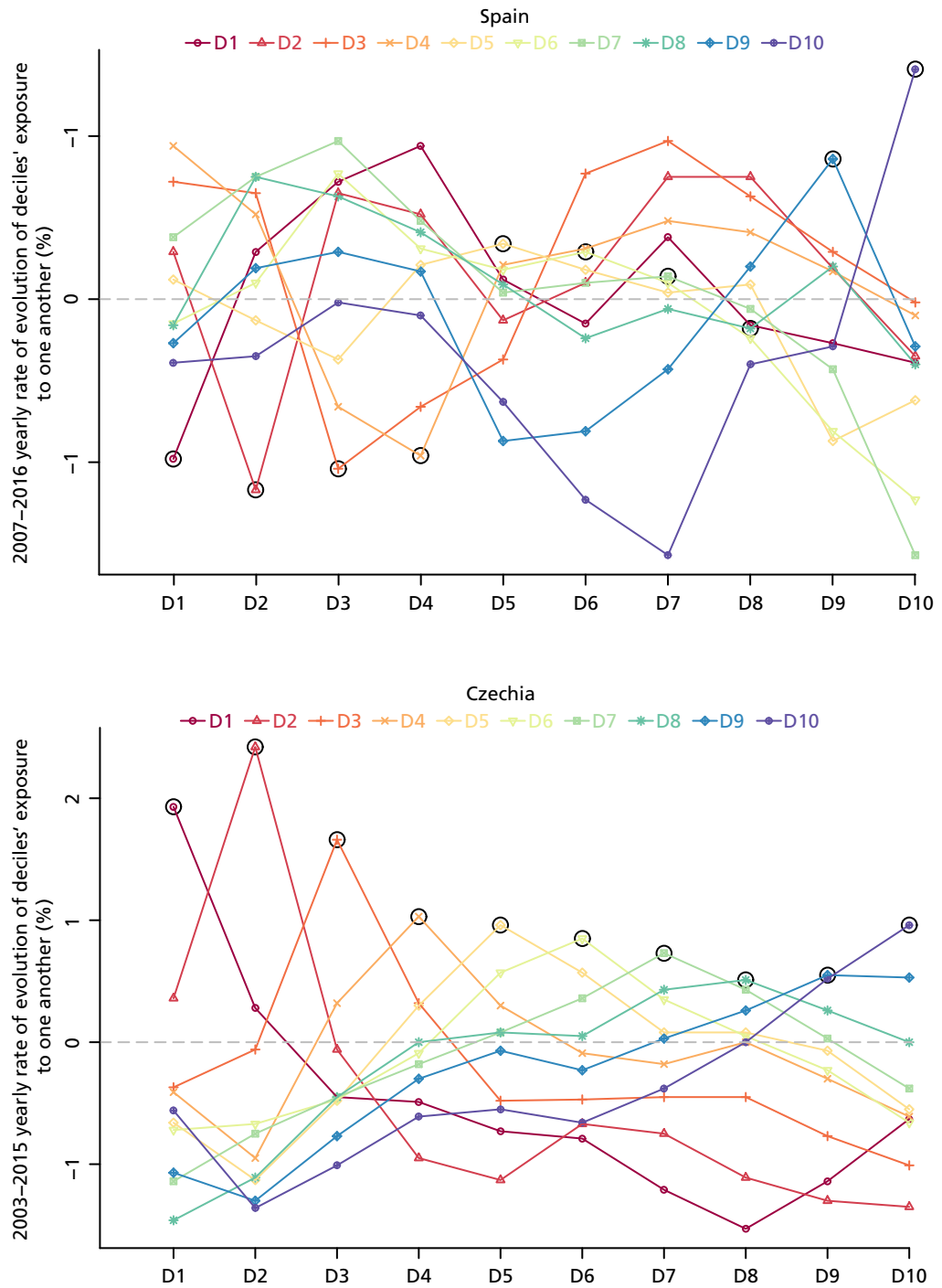


Figure S3 continued

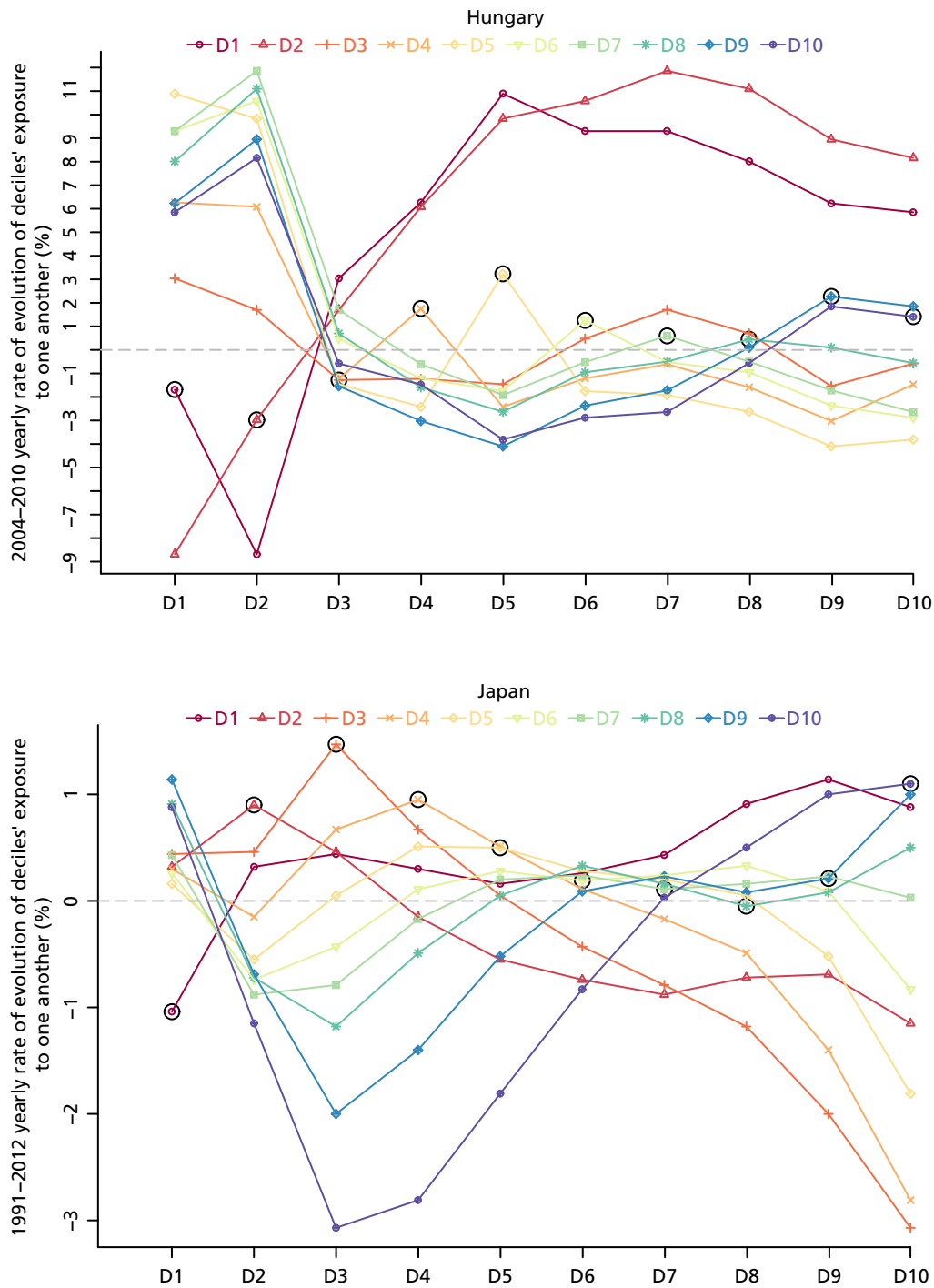
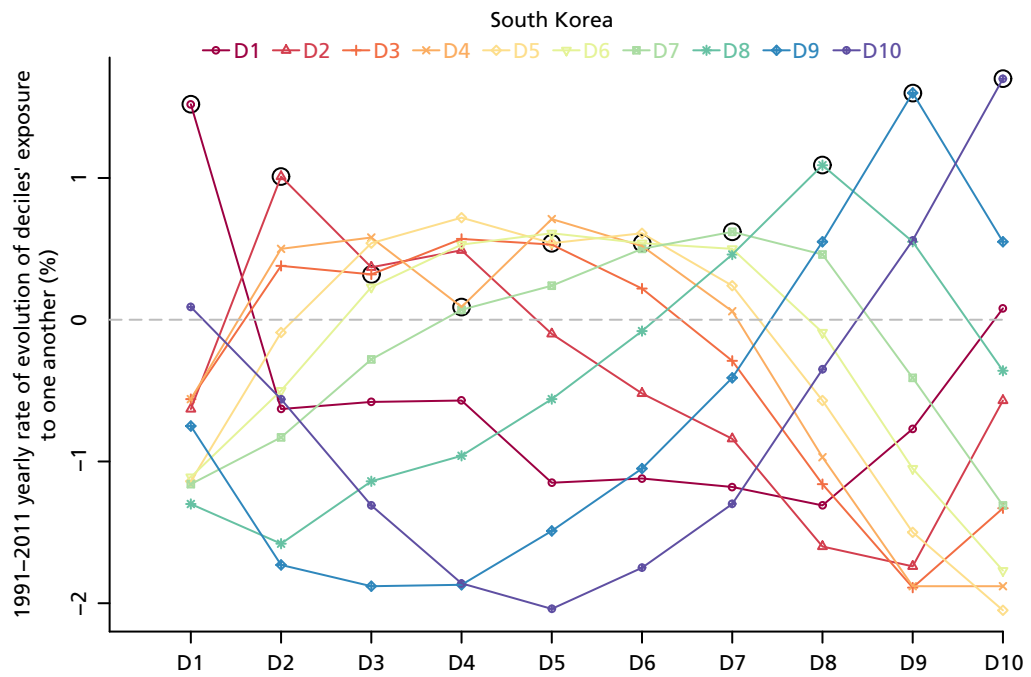


Figure S3 continued



Note: In Canada, top decile's (D10) exposure to bottom decile (D1) decreased at a yearly rate of -0.7% .

Figure S4 Top earner share of earnings

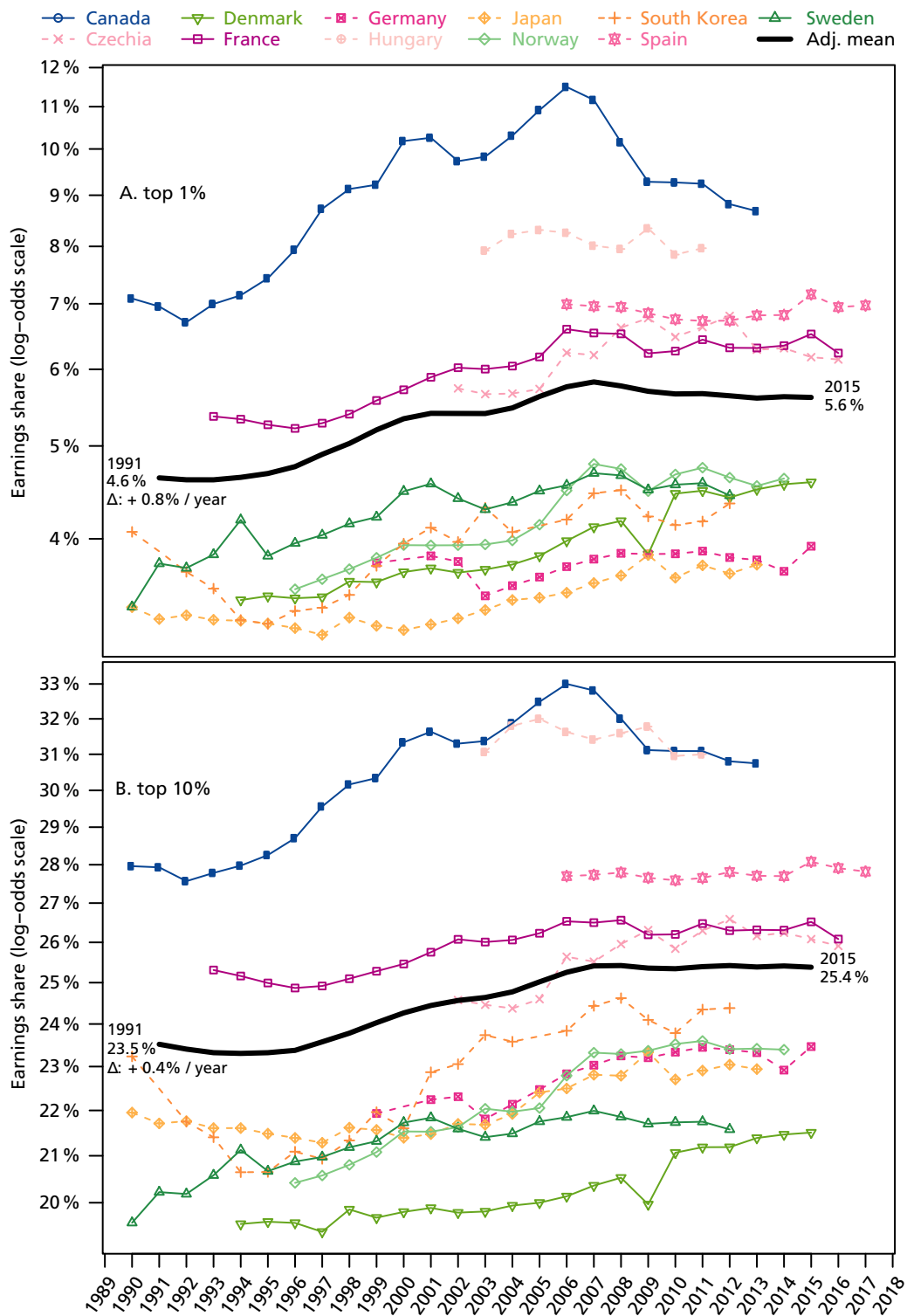


Figure S5 Exposure of migrants and natives to migrants at work

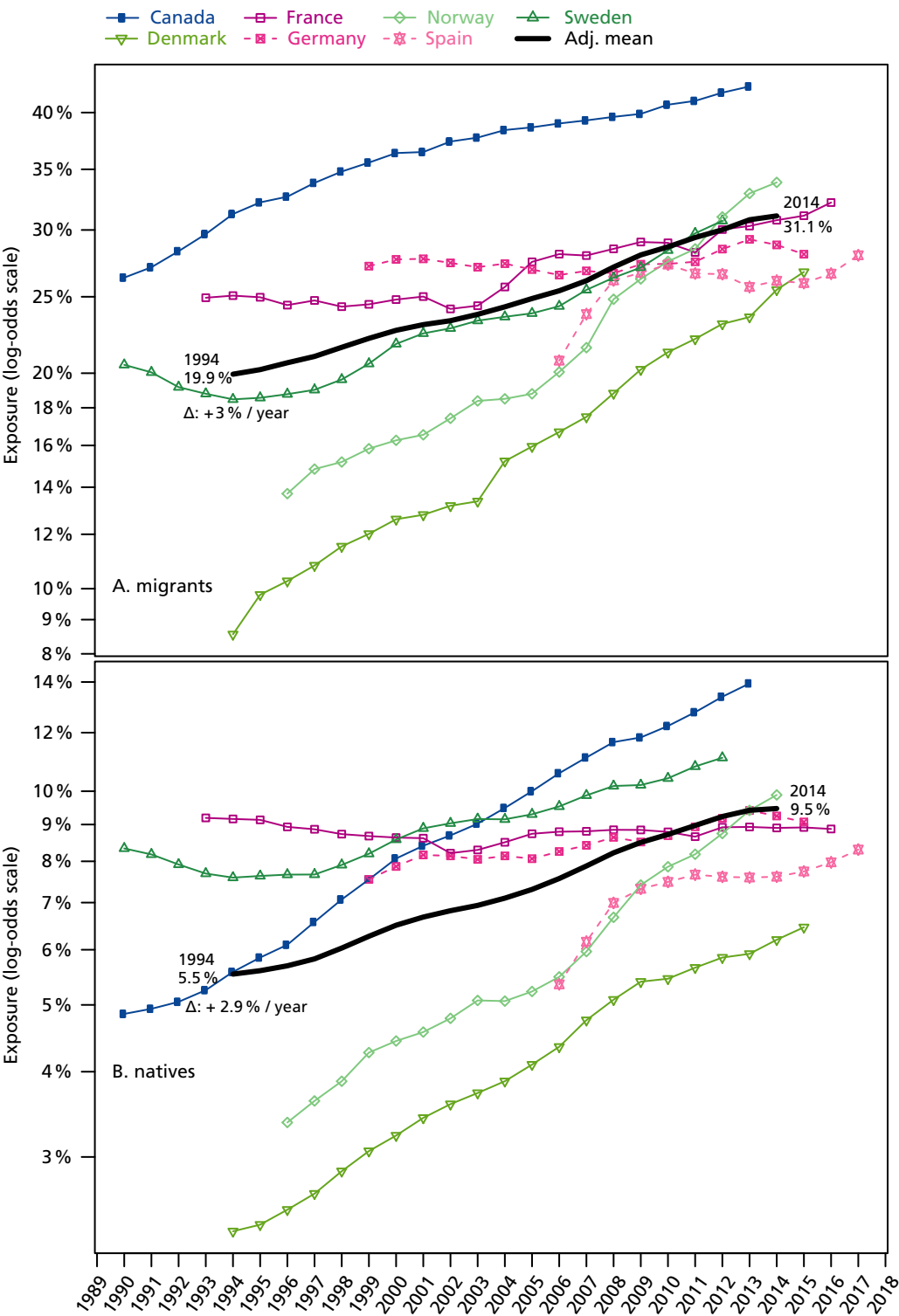


Figure S6 Relative workplace isolation of older and younger employees

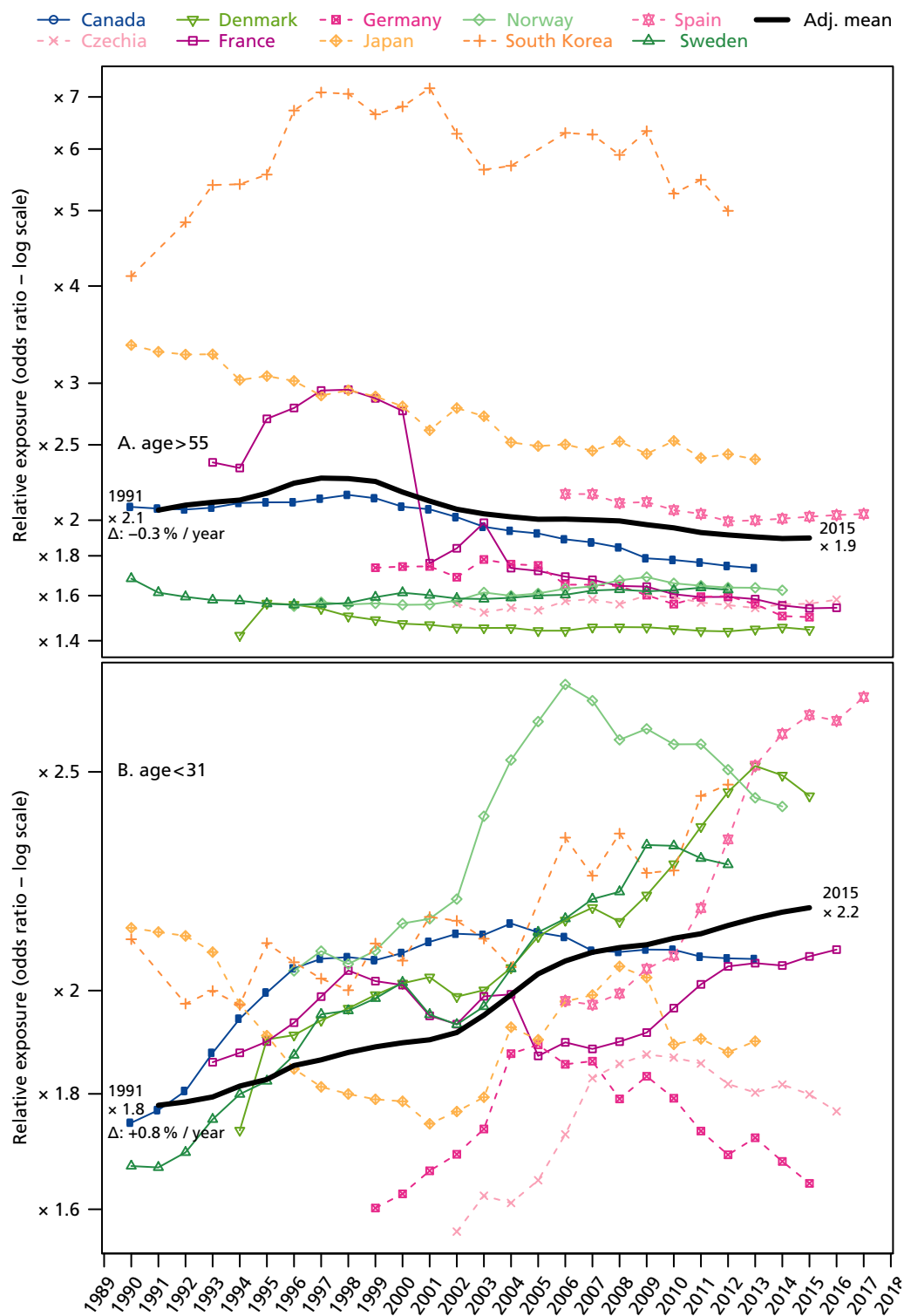


Figure S7 Tertiary education relative isolation at work

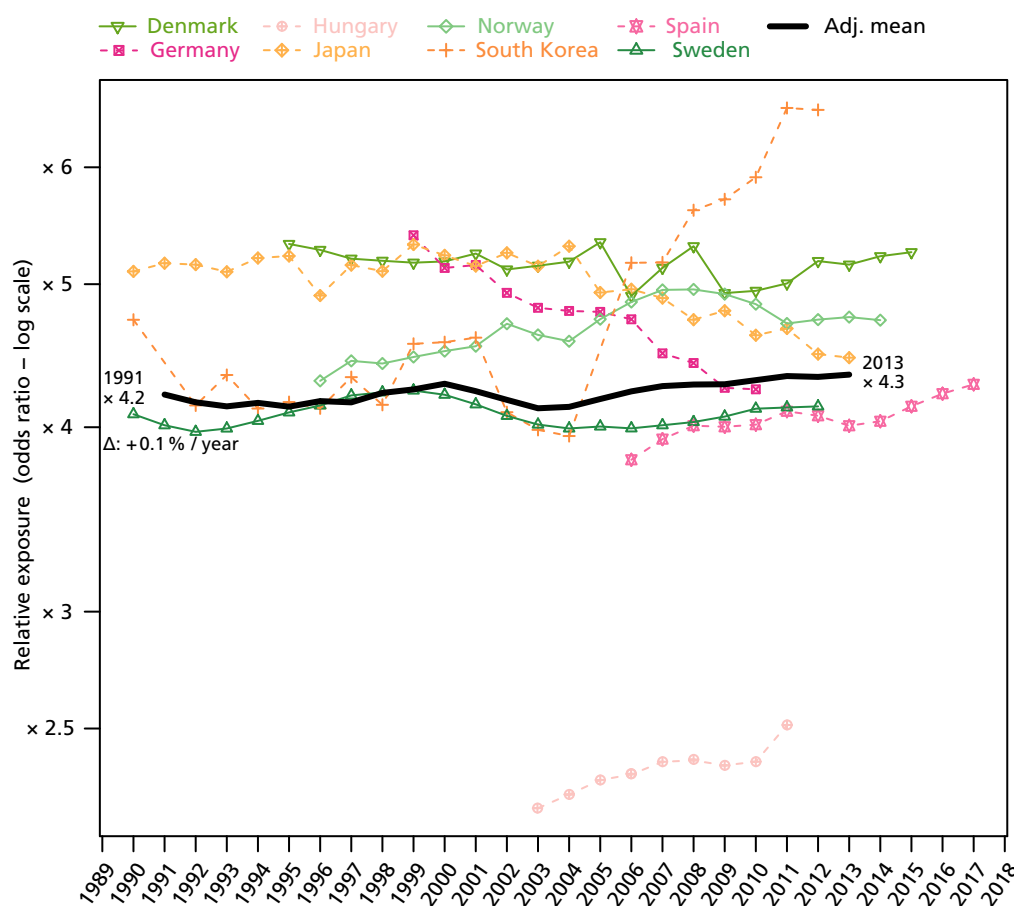


Figure S8 Relative isolation at work of managers and professionals, and working-class employees

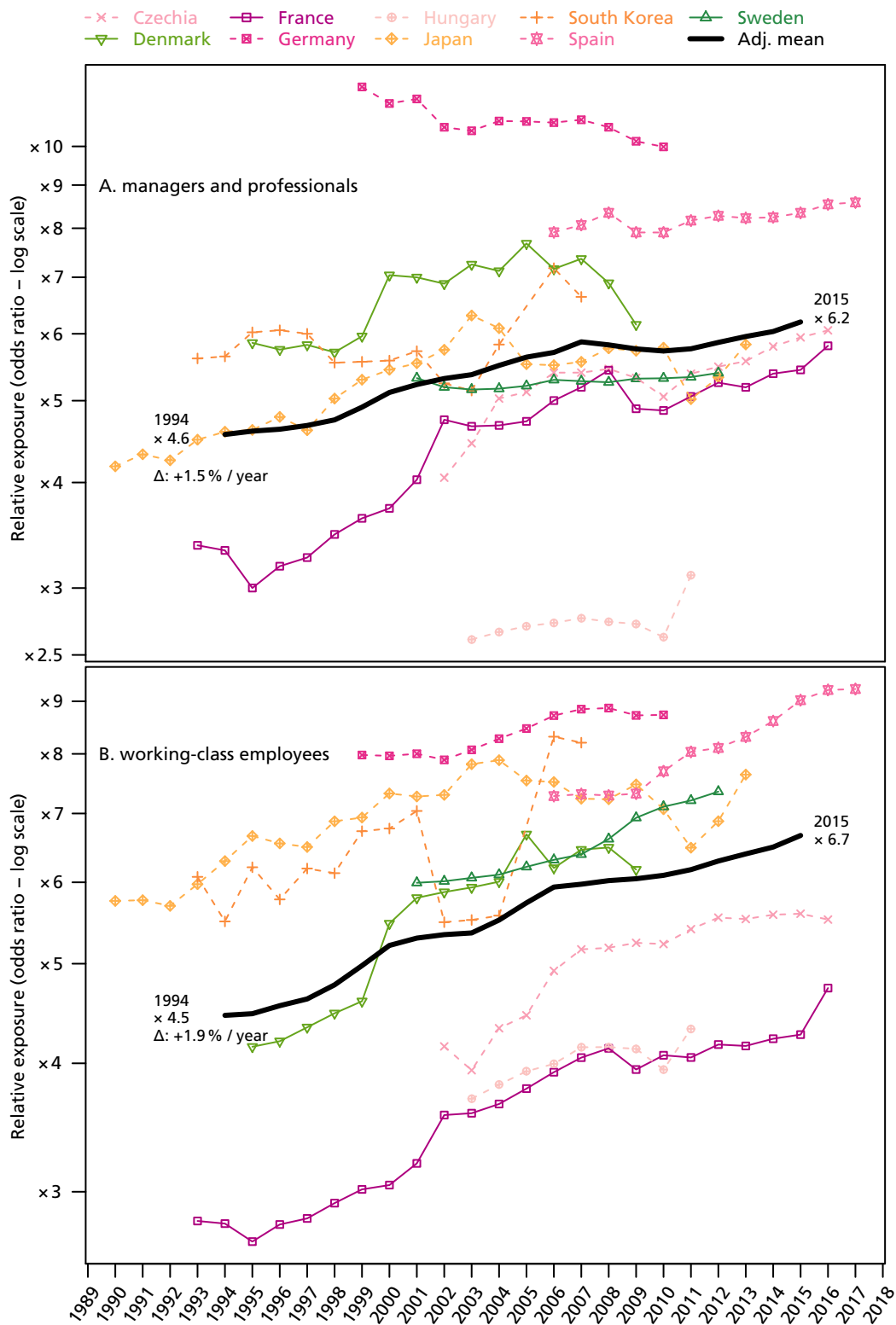


Table S1 Evolution of segregation of top earners by size of establishment and country

Measure	Size	Canada	Denmark	Norway	Sweden	France	Germany	Spain	Czechia	Hungary	Japan	South Korea	Adj. mean
<i>Evolutions</i>													
Δ share of employees	≤50	-0.2%	-0.2%	+1.6%	+0.8%	+0.5%	-0.4%	-2.7%	+4.2%	+1.1%	+0.2%	+6.3%	+1.0%
	51-200	+0.7%	+0.1%	-1.0%	+0.4%	+0.3%	-0.2%	-0.1%	+6.8%	+0.2%	+0.0%	-1.2%	+0.1%
	>200	-0.2%	+0.3%	-1.3%	-1.4%	-0.8%	+0.8%	+2.2%	-6.0%	-1.1%	-0.3%	-4.1%	-1.0%
Δ share of employees in national top 10 %	≤50	+0.8%	-0.7%	-0.9%	-0.6%	-1.2%	-1.6%	+0.9%	+2.0%	+1.1%	-0.9%	-0.9%	-0.6%
	51-200	+0.6%	-0.6%	+0.8%	-0.7%	+0.1%	-1.8%	+0.2%	-1.0%	-0.5%	-0.6%	-0.7%	-0.3%
	>200	-0.3%	+1.3%	+1.4%	+1.3%	+1.2%	+1.2%	-1.1%	+0.5%	+0.2%	+0.8%	+3.3%	+1.2%
Δ share of employees in national bottom 25 %	≤50	-0.5%	+0.2%	+0.1%	+0.3%	-0.4%	+0.4%	-0.7%	-1.6%	-6.3%	-0.5%	+0.6%	-0.3%
	51-200	-0.1%	-0.2%	-1.0%	+0.0%	-0.4%	+0.4%	+0.6%	+0.2%	+2.1%	+0.1%	-1.4%	-0.2%
	>200	+0.4%	-0.2%	-0.7%	-1.5%	+0.8%	-1.3%	+0.9%	-0.1%	+7.5%	+0.7%	-4.4%	-0.6%
Δ top 10 % absolute isolation	≤50	+1.1%	+0.9%	+0.2%	+0.9%	+1.6%	+0.4%	+1.6%	+3.8%	-0.2%	+0.3%	+3.2%	+1.1%
	51-200	+1.9%	+0.4%	+0.3%	+1.3%	+1.7%	-0.6%	+2.7%	+1.0%	-0.0%	+0.7%	+1.2%	+1.1%
	>200	+1.1%	+1.2%	+0.1%	+1.7%	+2.4%	+1.2%	+1.0%	+0.6%	+2.1%	+1.3%	+2.3%	+1.4%
Δ top 10 % absolute exposure to Q1	≤50	-0.8%	-1.4%	-1.4%	-1.0%	-2.6%	-0.7%	-2.0%	-4.7%	+1.9%	-1.0%	-2.4%	-1.5%
	51-200	-1.3%	-1.4%	-1.2%	-1.7%	-2.4%	-1.4%	-1.5%	-1.1%	+3.9%	-0.7%	-1.4%	-1.5%
	>200	-0.9%	-2.2%	+0.2%	-2.3%	-1.4%	-3.6%	+0.6%	-0.6%	+5.8%	-0.8%	+0.0%	-1.2%
Δ top 10 % relative isolation	≤50	+0.5%	+1.9%	+1.2%	+1.8%	+3.3%	+2.2%	+1.1%	+2.7%	-1.4%	+1.4%	+5.1%	+1.9%
	51-200	+1.8%	+1.2%	-0.4%	+2.4%	+2.1%	+1.2%	+3.4%	+2.3%	+0.5%	+1.5%	+2.4%	+1.8%
	>200	+1.8%	+0.2%	-1.5%	+0.2%	+2.0%	+0.4%	+2.6%	+0.3%	+2.6%	+0.9%	-0.4%	+0.6%
Δ top 10 % relative exposure to Q1	≤50	-0.4%	-1.7%	-1.5%	-1.3%	-2.2%	-1.0%	-1.4%	-3.0%	+9.1%	-0.5%	-3.0%	-1.2%
	51-200	-1.3%	-1.2%	-0.3%	-1.8%	-2.1%	-1.6%	-2.2%	-1.2%	+1.9%	-0.8%	+0.2%	-1.2%
	>200	-1.4%	-2.2%	+0.8%	-1.0%	-2.4%	-3.0%	-0.3%	-0.6%	-1.7%	-1.7%	+4.5%	-0.6%

Table S1 continued

End year level		≤50	31 %	50 %	57 %	51 %	47 %	47 %	24 %	9 %	32 %	40 %	38 %	38 %
share of employees	≤50	51–200	18 %	26 %	22 %	26 %	22 %	26 %	28 %	14 %	15 %	30 %	40 %	24 %
	51–200	>200	52 %	7 %	6 %	7 %	31 %	26 %	49 %	77 %	53 %	30 %	22 %	37 %
	>200		6 %	7 %	20 %	15 %	15 %	4 %	5 %	6 %	5 %	5 %	6 %	6 %
share of employees in national top 10 %	≤50	51–200	8 %	10 %	11 %	9 %	10 %	8 %	9 %	7 %	12 %	8 %	7 %	9 %
	51–200	>200	13 %	16 %	20 %	15 %	15 %	23 %	13 %	11 %	13 %	20 %	23 %	16 %
	>200		33 %	31 %	30 %	30 %	32 %	35 %	31 %	29 %	47 %	30 %	37 %	34 %
share of employees in national bottom 25 %	≤50	51–200	28 %	22 %	21 %	24 %	24 %	23 %	25 %	27 %	23 %	27 %	23 %	24 %
	51–200	>200	19 %	17 %	15 %	14 %	15 %	8 %	22 %	24 %	12 %	16 %	8 %	15 %
	>200		25 %	28 %	30 %	29 %	30 %	30 %	33 %	25 %	42 %	25 %	34 %	30 %
top 10 % absolute isolation	≤50	51–200	26 %	28 %	35 %	28 %	35 %	27 %	37 %	30 %	41 %	31 %	33 %	32 %
	51–200	>200	28 %	31 %	40 %	31 %	41 %	43 %	42 %	31 %	33 %	41 %	47 %	37 %
	>200		13 %	13 %	10 %	13 %	10 %	8 %	7 %	12 %	6 %	10 %	8 %	10 %
top 10 % absolute exposure to Q1	≤50	51–200	11 %	10 %	8 %	10 %	6 %	6 %	5 %	10 %	4 %	8 %	7 %	8 %
	51–200	>200	10 %	8 %	8 %	9 %	5 %	2 %	6 %	10 %	4 %	5 %	4 %	6 %
	>200		7.41	6.53	9.21	6.74	7.51	13.49	13.04	7.25	24.72	9.25	12.87	9.89
top 10 % relative isolation (odds ratios)	≤50	51–200	4.96	4.65	6.12	5.04	6.79	5.66	8.95	7.16	8.22	7.59	9.42	6.69
	51–200	>200	3.16	3.11	3.76	2.71	6.41	3.78	7.60	4.67	4.44	4.08	4.69	4.23
	>200		0.28	0.31	0.25	0.32	0.21	0.16	0.15	0.32	0.07	0.24	0.13	0.20
top 10 % relative exposure to Q1 (odds ratios)	≤50	51–200	0.31	0.36	0.29	0.35	0.20	0.21	0.16	0.30	0.13	0.22	0.24	0.24
	51–200	>200	0.42	0.39	0.45	0.48	0.23	0.19	0.19	0.33	0.29	0.22	0.35	0.30
	>200													

Note: In order to avoid artificial changes due to specificities of data collection for some years, we calculate levels and evolutions with a three-year moving average. For instance, exposure at the end of period for Canada calculated in 2012 is the average for 2011, 2012, and 2013.

Table S2 Evolution of segregation of top earners by industry and country

Measure	Industry	Canada	Denmark	Norway	Sweden	France	Germany	Spain	Czechia	Hungary	Japan	South Korea	Adj. mean
<i>Evolutions</i>													
Δ share of employees	finance	-0.4 %	-0.2 %	-3.9 %	-0.2 %	+0.2 %	-0.5 %	-1.1 %	+0.6 %	-0.8 %	-1.6 %	-0.3 %	-0.4 %
	manuf.	-2.3 %	-3.0 %	-2.5 %	-2.2 %	-2.9 %	-0.4 %	-5.4 %	-0.6 %	-2.0 %	-2.0 %	-4.9 %	-2.3 %
	other	+1.9 %	+2.7 %	+3.1 %	+2.1 %	+2.6 %	+0.4 %	+5.4 %	+0.6 %	+2.1 %	+2.2 %	+5.3 %	+2.2 %
Δ share of employees in national top 10 %	finance	+1.1 %	+2.7 %	+3.3 %	+2.2 %	+1.6 %	-1.2 %	-0.8 %	-1.8 %	+3.9 %	-0.0 %	-0.4 %	+0.6 %
	manuf.	-0.4 %	+0.5 %	-2.9 %	+1.6 %	+0.8 %	+1.4 %	+2.4 %	+1.5 %	+2.4 %	+1.6 %	+1.9 %	+0.9 %
	other	+0.0 %	-0.3 %	+1.0 %	-0.5 %	-0.2 %	-0.8 %	-0.1 %	-0.5 %	-1.5 %	-0.5 %	-2.1 %	-0.6 %
Δ share of in national bottom 25 %	finance	-0.0 %	-3.1 %	-2.9 %	-1.7 %	-0.9 %	+1.3 %	+1.3 %	+7.5 %	-0.4 %	+0.1 %	+2.6 %	+0.2 %
	manuf.	-0.6 %	-0.9 %	+0.2 %	-2.0 %	-1.7 %	-1.0 %	-3.6 %	-2.7 %	-0.4 %	-2.1 %	-2.6 %	-1.6 %
	other	-0.1 %	+0.0 %	-0.3 %	+0.1 %	-0.1 %	+0.1 %	-0.2 %	+1.3 %	+0.1 %	+0.9 %	+2.7 %	+0.5 %
Δ top 10 % absolute isolation	finance	+1.6 %	+2.6 %	+2.6 %	+3.0 %	+3.7 %	+0.7 %	+0.7 %	-1.0 %	+0.0 %	+0.7 %	+2.0 %	+1.7 %
	manuf.	+1.1 %	+1.3 %	-4.7 %	+2.8 %	+2.1 %	+1.3 %	+2.3 %	+1.5 %	+2.7 %	+2.4 %	+5.0 %	+1.7 %
	other	+1.2 %	+0.4 %	+1.8 %	+0.8 %	+1.7 %	+0.7 %	+1.9 %	+1.4 %	+1.0 %	+0.7 %	-0.1 %	+0.9 %
Δ top10 % absolute exposure to Q1	finance	-0.8 %	-3.0 %	-2.0 %	-2.8 %	-2.5 %	-1.9 %	-2.2 %	+6.4 %	+2.3 %	-0.6 %	+0.7 %	-1.4 %
	manuf.	-1.1 %	-2.6 %	+1.1 %	-3.4 %	-3.4 %	-3.8 %	-0.4 %	-2.5 %	+3.0 %	-3.7 %	-6.0 %	-2.5 %
	other	-0.9 %	-1.5 %	-1.5 %	-1.3 %	-2.3 %	-1.8 %	-1.1 %	-0.9 %	+6.1 %	+0.1 %	+1.3 %	-1.0 %
Δ top 10 % relative isolation	finance	+0.7 %	+0.3 %	-0.4 %	+1.6 %	+3.5 %	+2.5 %	+2.6 %	+1.0 %	-4.7 %	+1.0 %	+3.5 %	+1.7 %
	manuf.	+1.8 %	+1.1 %	-3.4 %	+1.8 %	+1.8 %	+0.4 %	+0.5 %	+0.1 %	+1.0 %	+1.3 %	+4.8 %	+1.3 %
	other	+1.5 %	+0.9 %	+1.4 %	+1.6 %	+2.5 %	+1.7 %	+2.7 %	+2.5 %	+2.9 %	+1.5 %	+2.1 %	+1.8 %
Δ top 10 % relative exposure to Q1	finance	-0.9 %	-0.1 %	+0.7 %	-1.6 %	-2.1 %	-3.5 %	-4.3 %	-1.2 %	+1.8 %	-0.9 %	-1.8 %	-1.5 %
	manuf.	-0.5 %	-1.9 %	+1.3 %	-1.6 %	-1.8 %	-3.3 %	+3.3 %	+0.1 %	+3.2 %	-1.7 %	-3.6 %	-1.1 %
	other	-0.9 %	-1.6 %	-1.4 %	-1.4 %	-2.3 %	-1.9 %	-1.0 %	-2.3 %	+6.3 %	-0.8 %	-1.2 %	-1.3 %

Table S2 continued

End year level	finance	4 %	4 %	2 %	2 %	4 %	3 %	4 %	2 %	4 %	4 %	7 %	4 %
share of employees	manuf.	9 %	14 %	11 %	15 %	17 %	26 %	22 %	31 %	28 %	25 %	33 %	21 %
	other	87 %	82 %	86 %	83 %	78 %	71 %	74 %	67 %	68 %	71 %	60 %	75 %
share of employees in national top 10 %	finance	17 %	31 %	23 %	30 %	29 %	20 %	43 %	36 %	32 %	25 %	21 %	27 %
	manuf.	11 %	11 %	12 %	13 %	14 %	18 %	12 %	9 %	11 %	11 %	9 %	12 %
	other	10 %	9 %	9 %	9 %	8 %	6 %	8 %	10 %	8 %	9 %	9 %	9 %
share of employees in national bottom 25 %	finance	15 %	6 %	9 %	12 %	7 %	11 %	3 %	9 %	7 %	16 %	22 %	11 %
	manuf.	16 %	19 %	16 %	13 %	13 %	12 %	14 %	22 %	25 %	21 %	20 %	17 %
	other	26 %	27 %	27 %	28 %	29 %	30 %	29 %	27 %	26 %	27 %	28 %	28 %
top 10 % absolute isolation	finance	26 %	41 %	36 %	43 %	49 %	37 %	54 %	45 %	49 %	36 %	44 %	41 %
	manuf.	28 %	24 %	29 %	30 %	36 %	41 %	38 %	19 %	32 %	33 %	45 %	33 %
	other	27 %	29 %	36 %	28 %	33 %	33 %	36 %	33 %	34 %	37 %	37 %	33 %
top 10 % absolute exposure to Q1	finance	9 %	5 %	6 %	7 %	3 %	5 %	1 %	6 %	2 %	10 %	5 %	5 %
	manuf.	8 %	9 %	8 %	7 %	4 %	2 %	5 %	11 %	4 %	4 %	3 %	6 %
	other	11 %	11 %	9 %	12 %	8 %	7 %	7 %	11 %	6 %	7 %	7 %	9 %
top 10 % relative isolation (odds ratios)	finance	2.03	2.00	2.37	2.33	3.60	2.98	2.26	1.89	3.10	2.05	4.62	2.60
	manuf.	4.02	3.00	3.84	3.67	5.01	4.67	7.17	2.99	5.44	5.55	13.89	4.87
	other	4.52	5.42	8.13	5.22	8.05	10.01	9.74	6.10	8.02	8.98	8.62	7.43
top 10 % exposure to Q1 (odds ratios)	finance	0.55	0.72	0.58	0.50	0.34	0.33	0.28	0.64	0.19	0.49	0.13	0.38
	manuf.	0.40	0.40	0.44	0.46	0.26	0.10	0.28	0.39	0.11	0.14	0.10	0.24
	other	0.32	0.32	0.25	0.34	0.20	0.15	0.18	0.30	0.15	0.19	0.18	0.22

Note: In order to avoid artificial changes due to specificities of data collection for some years, we calculate levels and evolutions with a three-year moving average. For instance, exposure at the end of period for Canada calculated in 2012 is the average for 2011, 2012, and 2013.

Table S3 Evolution of segregation of top earners by region and country

Measure	Region	Canada	Denmark	Norway	Sweden	France	Germany	Spain	Czechia	Hungary	Japan	Adj. mean
<i>Evolutions</i>												
Δ share of employees in national top 10 %	financial center	+0.1 %	+0.5 %	-1.7 %	+1.0 %	-0.3 %	+0.1 %	+0.7 %	+0.5 %	+1.2 %	-0.1 %	-0.2 %
	financial center other areas	-0.5 %	+0.5 %	-0.1 %	+0.4 %	+0.3 %	-0.7 %	-0.4 %	-0.1 %	-1.1 %	+0.0 %	+0.0 %
Δ share of employees in national bottom 25 %	financial center	+1.1 %	+1.1 %	+0.3 %	+0.9 %	+0.7 %	-0.2 %	+0.7 %	+2.1 %	-2.5 %	+0.9 %	+0.8 %
	financial center other areas	-0.2 %	-0.1 %	-0.2 %	-0.1 %	-0.2 %	+0.0 %	-0.1 %	-0.3 %	+0.6 %	-0.1 %	-0.1 %
Δ top 10 % absolute isolation	financial center	+0.6 %	+1.4 %	-0.5 %	+1.6 %	+2.2 %	+0.2 %	+1.2 %	+0.5 %	+0.8 %	+1.2 %	+1.1 %
	financial center other areas	+1.3 %	+0.8 %	+0.4 %	+0.8 %	+2.1 %	+1.1 %	+1.5 %	+1.2 %	+1.8 %	+0.9 %	+1.2 %
Δ top10 % absolute exposure to Q1	financial center	-0.5 %	-1.2 %	-0.9 %	-1.3 %	-2.4 %	-2.6 %	+0.3 %	+1.5 %	+4.0 %	-1.5 %	-1.2 %
	financial center other areas	-0.9 %	-1.9 %	-0.9 %	-1.6 %	-2.4 %	-2.6 %	-0.5 %	-1.9 %	+5.2 %	-0.5 %	-1.6 %
Δ top 10 % relative isolation	financial center	+1.2 %	+1.1 %	-0.6 %	+1.8 %	+2.9 %	+1.2 %	+2.3 %	+1.0 %	+2.1 %	+1.7 %	+1.5 %
	financial center other areas	+1.6 %	+1.2 %	+0.3 %	+1.5 %	+2.7 %	+1.5 %	+2.0 %	+1.6 %	+2.3 %	+1.2 %	+1.6 %
Δ top10 % relative exposure to Q1	financial center	-1.4 %	-2.4 %	-1.2 %	-2.4 %	-3.4 %	-2.4 %	-0.5 %	-0.8 %	+7.5 %	-2.6 %	-2.0 %
	financial center other areas	-0.9 %	-2.0 %	-0.7 %	-1.6 %	-2.3 %	-2.7 %	-0.4 %	-1.7 %	+4.6 %	-0.4 %	-1.4 %
<i>End year level</i>												
share of employees in national top 10 %	financial center	15 %	13 %	19 %	16 %	24 %	2 %	15 %	19 %	19 %	16 %	16 %
	financial center other areas	12 %	18 %	15 %	22 %	20 %	24 %	17 %	21 %	19 %	20 %	19 %
share of employees national bottom 25 %	financial center	10 %	9 %	9 %	8 %	7 %	10 %	9 %	7 %	8 %	8 %	8 %
	financial center other areas	23 %	20 %	18 %	20 %	18 %	13 %	21 %	20 %	19 %	15 %	19 %
top 10 % absolute isolation	financial center	25 %	26 %	27 %	26 %	27 %	25 %	26 %	26 %	26 %	27 %	26 %
	financial center other areas	26 %	37 %	33 %	42 %	48 %	48 %	46 %	43 %	43 %	45 %	41 %
top10 % absolute exposure to Q1	financial center	28 %	27 %	36 %	23 %	25 %	37 %	37 %	21 %	31 %	31 %	30 %
	financial center other areas	11 %	8 %	8 %	8 %	4 %	2 %	4 %	8 %	3 %	4 %	6 %
top 10 % relative isolation (odds ratios)	financial center	11 %	11 %	9 %	12 %	9 %	4 %	6 %	12 %	5 %	8 %	9 %
	financial center other areas	3.14	3.69	3.66	3.83	6.16	4.72	6.83	4.10	6.20	4.96	4.58
top10 % relative exposure to Q1 (odds ratios)	financial center	4.56	4.91	8.73	4.31	5.73	7.88	9.35	4.07	6.68	7.18	6.16
	financial center other areas	0.36	0.32	0.32	0.29	0.15	0.12	0.15	0.29	0.11	0.18	0.21
top 10 % relative exposure to Q1 (odds ratios)	financial center	0.32	0.32	0.26	0.37	0.25	0.12	0.17	0.36	0.14	0.21	0.23
	financial center other areas	0.32	0.32	0.26	0.37	0.25	0.12	0.17	0.36	0.14	0.21	0.23

Note: In order to avoid artificial changes due to specificities of data collection for some years, we calculate levels and evolutions with a three-year moving average. For instance, exposure at the end of period for Canada calculated in 2012 is the average for 2011, 2012, and 2013.

Table S4 Individual correlation between establishment segregation and residential segregation measures (year=2007)

	Top 1 % isolation	Top 1 % exposure to bottom 25 %
Canada	0.157***	0.079***
Denmark	0.095***	0.063***
Norway	0.164***	0.052***
Sweden	0.17***	0.099***
France	0.167***	0.075***
Germany	0.479***	0.065***
Spain	0.033*	0.040***
Hungary	0.144***	0.024***

Note: Standardized coefficients. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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