Top incomes and the gender divide

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2 Note by the authors. We are most grateful to Facundo Alvaredo, Jørgen Modalsli and Jakob Søgaard for their having supplied the results for Spain, Norway and Denmark, respectively. This has been a significant contribution to the paper and we wish to acknowledge this on the title page.
Abstract

In the recent research on top incomes, there has been little discussion of gender. A great deal is known about gender differentials in earnings, but how far does this carry over to total incomes? This paper investigates the gender divide at the top of the income distribution using tax record data for eight countries with individual taxation. It shows that women are strongly under-represented at the top of the distribution. Although the presence of women at the top has increased over time, the rise becomes smaller at the very top. The income gradient by gender has become more marked. The paper also shows that income composition differs by gender and exhibits significant changes over time, underlining the fact that it is not sufficient to look only at earned income.

Keywords: top income groups, gender, income composition

JEL Codes: D31, J16
1. Introduction: Women and top incomes

The literature on top incomes, initiated by Piketty (2001), has shown how, in many countries, there have been significant increases in the shares of total income accruing to those at the top in recent decades. Here we ask a simple question – how many of those in the top income groups are women? The gender composition of the top income group has been surprisingly little investigated. There is a strong suspicion that women are under-represented, but a shortage of hard evidence. Little too is known about whether the gender divide has been narrowing over time: the dynamics in the share of women at the top is, thus, the second issue we turn to. The analysis of the evolution of female representation in the top deciles brings up two further questions: is the pattern of under-representation of women that we identify at the very top evidence of a “glass ceiling” for incomes? And does the composition of income play a role in explaining the pattern of female representation at the top? The aim of this paper is to address these issues and contribute to build evidence on women and top incomes.

A rare exception to the lack of evidence on the presence of women in top income groups is the release of data by Statistics Canada reporting the proportion of women in the top 1 per cent of the income distribution: the share of women has risen from 11 per cent in 1982 to 23.2 per cent in 2015 (Statistics Canada, 2017a). This evidence is interesting in its own right, suggesting that the gender divide has narrowed but that it remains large. The evidence also points to the reason why the gender composition has been relatively little studied. The Canadian income tax system is based on the individual, so that individual incomes can be identified (with qualifications discussed below), whereas in the United States income tax is levied on the joint income of couples, so that individual incomes are not fully recorded in the tax data. Aggregation is also the case in France, where the top incomes literature commenced. Canada is not however alone, and in this paper we explore the evidence for a number of countries that have independent taxation of incomes: Australia, Canada, Denmark, Italy, New Zealand, Norway, Spain and the UK. These eight countries cover a range of those in the OECD and provide a number of potential contrasts.

The reader may ask why we are concerned with total income. Earned income, the largest component of income, is the subject of an extensive literature, which documents the extent of gender gaps in earnings, their evolution over time (for cross-country evidence see, for example, Blau and Kahn, 2003, Gregory, 2009, Ponthieux and Meurs, 2015, Olivetti and Petrongolo, 2016; for a focus on the US, Blau and Kahn 1997, 2000 and 2006) and offers explanations for their presence and temporal variations (Altonji and Black, 1999, Bertrand, 2011 and Olivetti and Petrongolo, 2016 are comprehensive surveys). The under-representation of women at the top of the wage distribution is commonly referred to as the “glass ceiling”. For instance, in their study of Swedish data, Albrecht, Björklund and Vroman (2003) define the glass ceiling as a “phenomenon whereby women do quite well in the labour market up to a point after which there is an effective limit on their prospects” (p.146). They add that “the existence of a glass
ceiling would imply that women’s wages fall behind men’s more at the top of the wage distribution than at the middle or bottom” (p.146). The presence of a glass ceiling in terms of wages is highlighted, for example, by Arulampalam, Booth and Bryan (2007) in a selection of European countries. Using French data, Gobillon, Meurs and Roux (2015) find that the gender difference in the probability of getting a job increases significantly along the wage ladder. With data for the US between 1980 and 2010, Blau and Kahn (2017) show that the gender pay gap declined more slowly at the top than at the middle or bottom of the wage distribution. Related evidence by Goldin (2014) suggests that the gender wage gap is higher among college graduates in the US. In the analysis of Fortin, Bell and Böhm (2017), the slow pace at which the gender pay gap has decreased in Canada, Sweden and the UK in recent years is related to the evolution in top income shares in these countries.

Another way of looking at gender gaps at the top of the earnings distribution is to focus on pay differences among workers in highly paid occupations. Bertrand et al. (2010) report that the gender earnings gap of MBA graduates working in the financial and corporate sector in the US is large and rising over their career. Similar findings are reported for young lawyers in the US, see Azmat and Ferrer (2013). Gender differences in training, job interruptions, weekly hours worked, productivity and aspirations are the explanatory factors proposed. In contrast, Goldin and Katz (2012) find relatively small pay gaps for pharmacists when compared to other occupations requiring a college education. The authors attribute this trend to the changing structure of the labour market for pharmacists, where the development of large chains is slowly replacing independent shops. Parental leave (Albrecht, Thoursie and Vroman, 2015) and child penalties (Kleven, Landais and Søgaard, 2017) are other factors that have been explored to explain the larger gender wage gaps at the top of the earnings distribution, or for highly educated workers.

Complementary evidence shows that there are few women in the top percentiles of the earnings distribution. Denk (2017) reports that the share of women among the top 1 per cent earners in European countries varied between about 25 and 10 per cent, in 2010. Guvenen, Kaplan and Song (2014) point out the relative absence of women at the top of the US earnings distribution. Using data for the period 1981-2012, they show that the share of females among top earners has increased by more than a factor of 3. However, in 2012, the earnings share of females was only 18 per cent of the earnings of all individuals in the top 0.1 per cent, and 11 per cent of the earnings of the top 1 per cent, with all of the increases in the top 0.1 per cent taking place in the 1980s and 1990s, and almost no improvement in the last decade. Kopczuk, Saez and Song (2010) also document the increase in the share of women in selected high earnings groups in the US in the last three decades, and argue that this increase was responsible for the reduction in long term inequality among all workers. The share of women in the top 1 per cent of the earnings distribution in the US however stood at 14 per cent in 2004. Using individualized series where each spouse is assigned his or her labour income, Piketty, Saez and Zucman (2018) show that in the
US the share of women at the top of the distribution of factor labour income has increased over time, though at a much smaller rate at the very top.\footnote{For definitions, see also Alvaredo, Atkinson, Chancel, Piketty, Saez and Zucman (2016).}

Earnings are however only part of the story. We have to take account of self-employment income and capital income as well as earned income. Self-employment and capital income are particularly important sources at the top of the distribution and they may change the gender inequality picture. The importance of factor sources in affecting overall household income inequality and its dynamics is well-recognised in the literature. García-Peñalosa and Orgiazzi (2013), for instance, document the key role of self-employment and capital income in the increase in income inequality observed over the last three decades in six OECD countries. We here look at factor sources from the gender angle and with a focus on the top.

Equal pay and laws outlawing discrimination in employment do not apply to the self-employed, where women may also be disadvantaged. According to Boden (1999) who focuses on the US, women’s lower wage returns to observed worker characteristics have a positive and significant effect on women’s decision to switch from wage employment to self-employment. Williams (2012) reports similar results using data for a set of European countries. When one looks at self-employed or entrepreneurial income, access to credit and its cost are crucial. Ongena and Popov (2016) find that in countries with high gender bias (in their sample these are Bosnia, Croatia, Hungary, Macedonia, Romania, Slovenia, Spain and Yugoslavia), female entrepreneurs are more likely to opt out of the loan application process. Female entrepreneurs may also have to pay higher rates to obtain loans, as shown by Alesina, Lotti and Mistrulli (2011). These biases may limit the growth potential of female income, even in the absence of gender differences in wages. It is therefore important to consider self-employment and entrepreneurial income when investigating gender gaps.

The role of women in wealth-holding - and hence capital income - has long been discussed in the literature on the distribution of wealth. There is evidence that in some countries women have in the past owned a significant fraction of total wealth and hence have received a significant share of capital income. For the UK, Atkinson and Harrison (1978) provide evidence that the share of wealth owned by women increased between the 1920s and the 1950s, and declined between the late 1950s and the early 1970s. In the US, Lampman reported in 1962 that “women top wealth-holders have gradually increased, both in numbers and in wealth, relative to men” (1962, page 18). However, Edlund and Kopczuk (2009) point out that the share of women at the top of the wealth distribution peaked in the US in the 1960s and then declined, especially in the top percentiles. We have therefore to ask what has happened to capital income, and how the inclusion of capital income influences the picture of gender inequality, which we can do by shifting our attention from wages to income.
The next section (Section 2) describes the strengths and weaknesses of the income tax data as a source of evidence about the gender divide among top incomes. We then examine in Section 3 the gender composition of top incomes in the eight countries. How far are women under-represented in the top income groups, such as the top 10 per cent? How has this changed in recent decades? Are there marked differences between countries? The results demonstrate that in all eight countries women are indeed severely under-represented in the top 10 per cent and all higher percentiles. In addition, women presence in the top 10 per cent has increased in almost all countries over the period considered, but less so at higher percentiles.

Is the pattern of under-representation of women at the very top evidence of a “glass ceiling” for incomes? We investigate this hypothesis in Section 4. The Pareto distribution is often used to describe the shape of the income distribution at the top (e.g. Cowell, 2011; Atkinson, Piketty and Saez, 2011) and provides a measure of the concentration of income. As one moves up the income ladder, both the number of men and women decline: comparing the Pareto coefficients computed separately for men and women gives us an indication of how much faster than men, women are disappearing from top percentiles. We find that in all countries the concentration of the male income distribution at the top is higher than the female and that for some countries the male concentration has become stronger in more recent years. The investigation on the glass ceiling in incomes links our contribution to both the labour economics literature, which investigates the behaviour of gender wage gaps along the distribution, and the literature on income distribution. This latter literature also highlights the importance of the different sources of income in the determination of the inequality patterns.

In Section 5, we thus disaggregate total income into three income sources: this provides useful insights into the factors underlying differences by gender, in addition to being of interest in its own right. We examine for a selection of our countries the breakdown of income into earnings, self-employment income and capital income. We find that women at the top of the income distribution have a larger share of their income coming from investment and a lower share coming from earnings compared to men in all the countries considered. Capital income is therefore critical for female access to the top percentiles. However, its influence has decreased over time, whereas the shares of earnings for women display the opposite behaviour, signalling that women inroads in top percentiles has hinged on improvements in their labour market outcomes. We propose different potential explanations for these patterns and discuss them. The main conclusions are summarised in Section 6.

2. Income tax data on the gender divide

The paper makes use of information from income tax records. As such, it is subject to evident limitations. The data are drawn from an
administrative process and reflect the underlying tax legislation in their definitions of income and of the tax unit. Additionally, the information available is limited to what is collected for tax purposes in the different countries. In most cases, we have very limited or no information on variables like family structure, education, labour market history, hours worked or sector of employment. The administrative process doubtless has many shortcomings, and tax data are affected by avoidance and evasion. The strengths and weaknesses of income tax data have been extensively discussed in the recent literature on top incomes (see, for example, Atkinson, Piketty, and Saez, 2011). Here we consider only the aspects that are likely to influence the conclusions regarding the gender dimension.

First, the results relate only to countries, and to years, for which the income tax is operated on an independent basis, taxing husbands and wives separately.\(^4\) Pressure for independent taxation, and its ultimate introduction, may have reflected an increased importance of wives’ incomes. On the other hand, the revenue cost of joint taxation is higher when incomes are more unequal by gender. It is therefore also possible that a revenue maximising government would be more willing to adopt individual taxation when inequality is more pronounced. We may therefore be looking at countries, and periods, that differ systematically in terms of the gender distribution of income from those that operate joint taxation.

Second, in the case of couples, the attribution of income to the individuals depends on the practices of the tax authorities. They receive information from employers, banks, property registers, etc., and the taxpayers are obliged to check and if necessary provide additional information. In the case of Norway, this may lead to capital income, such as bank interest, being allocated to the husband, and hence over-stating the male share. Inspection of the micro-data however shows that the receipt of large capital incomes for both spouses is not uncommon at the top end of the distribution.\(^5\) The same may apply to other countries. It is also possible that a given total income for a couple from a particular source is automatically divided into two equal parts, in which case gender inequality may be under-stated.

Third, the tax system may influence household decisions. With a progressive income tax system and individual taxation, there may be an

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\(^4\) In Spain, married couples can choose to file their tax returns jointly or individually. When there is joint filing, it is not possible to distinguish the incomes of the members of the couple separately. In those cases, the micro-data base identifies the gender of the individual with highest incomes in the couple. Around 20% of the tax returns in the top 10 per cent and top 1 per cent of the income distribution are joint. When both members of the couple have non-zero incomes, the joint filing is clearly disadvantageous, the more so for relatively high incomes. We have considered that all joint files at the top of the distribution are individual (so one of the members has zero or very little income), and attributed them to the member of the couple with highest incomes. Throughout the period, 90-95% of joint income tax files correspond to men. A small fraction of joint income tax files corresponds to sole-parent families.

\(^5\) We are grateful to Jørgen Modalsli for this information.
incentive to allocate artificially some income components to partners with lower income, generally women. Tax records may, thus, over-state the presence of women in top percentiles. Incentives for income splitting may have changed over time - besides being different across countries - with shifts in tax progressivity, or changes in regulations and may have been stronger in the past, when women’s involvement in the labour market was lower.

Finally, it is possible that the propensity for tax evasion differs by gender. If women were more tax compliant than men, our measure of the extent of the gender division may be underestimated. Kleven, Knudsen, Kreiner, Pedersen and Saez (2011) in their tax enforcement field experiment in Denmark show that the role of social variables such as age and gender is small compared to the role of third party reporting in the decision to evade. However, their estimates reveal that being female is always negatively associated with the probability of evading taxes. Research based on survey evidence about attitudes towards tax evasion highlights that women are more willing to comply. Torgler and Valev (2010) using 3 waves of the World Values Survey/European Values Survey data show that women consider tax evasion less justifiable than men and that the gender gap in attitudes towards tax evasion has not changed over time with the changing economic role of women in society, see also McGee (2012). Laboratory experiments also tend to find that women are more compliant than men; see Kastlunger, Dressler, Kirchler, Mittone and Voracek (2010).

Overall, these biases suggest that the presence of women at the top of the income distribution is likely to be overestimated in our data, and as a result, that our analysis is likely to under-estimate the real extent of the gender divide at the top.

3. How many women are in the top income groups

We begin with a straightforward account of the gender composition of the top income groups. In each case, the income groups are defined as percentages of the total population aged 15 and over (20 and over in Canada and Spain), and relate to total gross income as defined for tax purposes excluding capital gains, whenever possible, to ensure higher level of comparability across countries. Results including capital gains are briefly discussed at the end of this section.

The data come from various sources and, for some countries, build on the work of colleagues and coauthors (further details are reported in Appendix 1). The source for the Australian data are customised tables provided by the Australian Tax Office (see also Atkinson and Leigh, 2007a). Those for Canada come from Statistics Canada, in particular from their Longitudinal Administrative Database, and those for Denmark from the micro-data

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6 For a critical discussion of this literature, see Slemrod and Weber (2012) who point out that the absence of a direct measure of evasion in the surveys, makes it hard to infer how tax morale affects levels of tax evasion.
analysed by Jakob Søgaard (see Atkinson and Søgaard, 2016). In the case of
Italy we have used tabulated data provided by the MEF-Department of
Finance. For New Zealand we have used both previously published
tabulations (see Atkinson and Leigh, 2007b) and tabulated data supplied by
the New Zealand Inland Revenue. For Norway we build on the micro-data
analysed by Jørgen Modalsli (see Aaberge, Atkinson and Modalsli, 2016). In
the case of Spain we use the micro-data analysed by Facundo Alvaredo (see
Alvaredo and Saez, 2009 and 2010). Lastly, for the United Kingdom we
collected micro-data from the Survey of Personal Incomes which gives a
representative sample of the UK population of taxpayers. No micro data are
currently available for 2008/9, 2011/12, 2012/13 and 2015/16. Figures for
2011/12, 2012/13 and 2015/16 are hence based on interpolations of the
published tabulations of the Survey of Personal Incomes. 

Results on the share of women in top income groups for the last data
available in all countries, 2013, are shown in Table 1. Figures for Sweden
come from the study by Boschini, Gunnarsson and Roine (2017) and are
added for comparison. Countries in the table are ranked by highest share of
women in the top 10 per cent in 2013.

The first striking feature - one that we did not expect when we
started collecting the data - is the ranking of countries in Table 1 and the
relative similarity of proportions in a subset of these countries. Spain is the
country with the highest share of women in the top 10 per cent in the
Table, at almost 35 per cent. Norway with a share just below 22 cent is the
country with the lowest share of women in the top 10 per cent in 2013. We
also see that for five of the nine countries, the proportion of women in the
top 10 per cent lay between 28 and 31 per cent. Similar differences across
countries are also present when we look at the proportion of women in the
top 1 per cent of the income distribution: it lay between 14 per cent in
Norway and 25 per cent in Spain. For six of the nine countries, the
proportion was between 17.6 and 22 per cent.

The ranking of countries in Table 1 is at odds with what one would
expect having a broad-based index of gender disparity in mind. For
example, the Global Gender Gap Index of the World Economic Forum ranked
Norway the third most equal of 136 countries in 2013, while Spain was
ranked 30th most equal. The Gender Inequality Index from the UN provides
a similar picture with Norway being fifth most equal in 2013, relative to

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7 Time trends may be affected by changes in the taxation of dividends in 2001 and in 2006,
and a change in the definition of income in 2005. See Aaberge, Atkinson and Modalsli
(2013) for more details. We do not report statistics for 2005 as a result of the change in
the definition of income that year.

8 No data currently available for 2008/09. The results from the tabulations are close to
those from the micro-data: for example, for 2010/11, a year for which we have both sets of
data, the share of women in the top 10 per cent is 28.3 per cent in the micro-data and 28.1
per cent from the tabulations, and the share of the top 1 per cent is 16.8 per cent in the
micro-data and 16.9 per cent from the tabulations. The UK micro datasets are available
through the UK data archives. Crown copyright material is reproduced with the permission
of the Controller of HMSO and the Queen’s Printer for Scotland.
Spain’s 16th rank-position. By the same token, if we ranked these countries in ascending order of the size of the gender wage gap at the median, Norway would rank first, followed by New Zealand and Denmark (OECD database). Recent studies, however, highlight that in spite of Norway’s top achievements in terms of female employment rates and political empowerment, there is still a low share of women at the top of firms’ hierarchy (Bertrand, Black, Jensen and Lleras-Muney, 2014) and a strong occupational segmentation in the labour market (OECD, 2012).

Another issue relates to the representation of women at the top of high paying sectors. The study by Bell and van Reenen (2013) suggests that the evolution of top incomes in the UK has been closely related to the evolution of top earnings and that most of these pay gains have been concentrated in the financial sector. Interestingly, Denk (2017) reports that about a third of top paying jobs in Norway were found in the manufacturing sector, where the average presence of women is typically low, whereas the Health and Social Care industry provided the largest share of top jobs in Spain, accounting for more than 20 per cent of high paid jobs in 2010.

Bertrand, Black, Jensen and Lleras-Muney (2014) also show that the law on gender quotas on boards introduced in Norway in 2005 improved the representation of female employees at the very top of the earnings distribution within firms that were mandated to increase female participation on their board. However, these gains did not trickle-down to the rest of the distribution, i.e. gender quotas on boards did not have a wider impact on the labour market and did not raise the number of women in managerial positions more generally. These factors imply that women are relatively scarce at the top of the earnings distribution in Norway compared to other OECD countries (OECD, 2012) and this is likely to contribute to their position at the top of the income distribution.

Overall, these sharp differences in ranking suggest that studying top incomes may shed light on a different and under-explored dimension of gender disparity.

The second striking feature - and one that we did expect - is the decline in the proportion of women as one rises higher on the income scale. The share of women in the top 10 per cent is between 1.3 and 1.9 times the share of women in the top 1 per cent. There is a similar decline in moving from the top 1 per cent to the top 0.1 per cent, except in Norway where the shares are almost identical. In most countries for which we have data, the proportion of women in the top 0.1 per cent is about half or less that in the top 10 per cent. This decline is much less marked in Norway with a ratio of 0.63 and Australia, with a ratio of 0.67. In contrast, it is particularly strong in Denmark and the UK with ratios of 0.35 and 0.39 respectively. The share of women at the very top, and the different extent at which they decline moving from the top 10 per cent to the top 0.1 per cent can be influenced by a range of factors. These shares not only reflect the presence of women at the top the earnings distribution, but also what happens in terms of self-employment and investment income. Additionally, opportunities for income
splitting, while limited with labour income, can be significant for other sources of income and influence the pattern of the female presence at the top. We return to this point in Section 5.

Table 1 Proportion of women in top income groups in 2013 and changes since 2000

<table>
<thead>
<tr>
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<th>Values in 2013</th>
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<tbody>
<tr>
<td></td>
<td>Top 10%</td>
<td>Top 1%</td>
<td>Top 0.1%</td>
<td>Top 10%</td>
</tr>
<tr>
<td>Spain</td>
<td>34.8</td>
<td>24.9</td>
<td>19.8</td>
<td>10.2</td>
</tr>
<tr>
<td>Denmark</td>
<td>30.9</td>
<td>16.2</td>
<td>10.8</td>
<td>10.6</td>
</tr>
<tr>
<td>Canada</td>
<td>29.8</td>
<td>22.0</td>
<td>15.9</td>
<td>4.1</td>
</tr>
<tr>
<td>New Zealand</td>
<td>29.3</td>
<td>18.2</td>
<td></td>
<td>1.2</td>
</tr>
<tr>
<td>Italy</td>
<td>28.5</td>
<td>19.1</td>
<td>13.4</td>
<td>3.2</td>
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<tr>
<td>UK</td>
<td>28.0</td>
<td>18.0</td>
<td>10.8</td>
<td>6.2</td>
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<tr>
<td>Sweden</td>
<td>27.3</td>
<td>17.6</td>
<td>14.3</td>
<td>5.4</td>
</tr>
<tr>
<td>Australia</td>
<td>25.7</td>
<td>20.3</td>
<td>17.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Norway</td>
<td>21.5</td>
<td>13.7</td>
<td>13.6</td>
<td>2.8</td>
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</table>

Changes over time

Table 1 shows the percentage points changes in the share of women in top percentiles between 2000 and 2013. This is the period of time for which we have data for all the countries considered. We see that Spain, and also Denmark to some extent, have experienced a large increase in the share of women at the top, while increases have been much more muted for New Zealand, Norway and Australia. If we look at the dynamics of gender wage gaps at the median (see the OECD employment database), UK, Denmark and Canada are the countries in which the decline has been the strongest over the same period, followed by Australia and Norway, which, as said above, did not experience large changes at the top. These observations highlight once more that the information on gender disparity we can obtain from top incomes data does not necessarily align with the one we read in labour market data.

We now look at each country separately to account for all the data we have, which, for some countries, go further back in time and, in many cases, also provide information after 2013. The series of graphs in Figure 1 show the evolution of the gender composition of top income groups in the different countries for the years for which we have data. Statistics are reported in Online Appendix 1. In each case the vertical axis and the time period on the x axis are the same. In most cases the data commence in the 1990s. For Denmark, the data go back to 1980. For two other countries
(New Zealand and Canada), the data go back much further in time, 1953 and 1942 respectively, but we examine the more recent years first. \(^9\)

Figure 1 about here

The proportion of women in top income groups has, in general, been rising over time, but the experience is diverse and in Australia there is little sign of an upward trend at most percentiles (albeit over a relatively short period). Starting with the top 10 per cent, the proportions of women have increased since the 1990s at a rate around 0.25 percentage points a year in Italy and New Zealand, about 0.4 percentage points in the UK and Canada, and 0.6 to 0.7 percentage points a year in Denmark and Spain. In the UK in 1995/96, women made up 19.9 per cent of the top 10 per cent, and this figure increased to 28.3 per cent in 2015. A remarkable increase is observed in Denmark, where the share of women in the top 10 per cent was around 10 per cent in the 1980s and went above 30 per cent in 2013. In the case of Norway, account has to be taken of the special episode in 2005 when top income shares in Norway spiked as a result of the pre-announcement of a permanent dividend tax implemented in 2006. The changes in Norway have therefore to be considered separately in terms of the periods before and after 2005. This shows a modest increase in the proportion for the top 10 per cent of some 0.15-0.25 percentage points per year in both sub-periods.

All the series cover the first years of the recent economic crisis. There are some indications that the rise in the share of women in top percentiles stalled in many countries from around 2009/10 onwards. The change in trends is particularly marked at the top 10 per cent in Canada, Denmark, New Zealand and the UK, but is also visible at higher percentiles in several countries. The stall in the increase in the share of women at the top of the income distribution is reminiscent of the slow down reported for gender wage gaps at the mean and median in many countries in recent years. The slow-down in the labour market, however, started much earlier, in the late 1990s or early 2000s. The difference in timing suggests that factors affecting the other sources of income might also be important for the trends we observe here.

Examination of Panels A to H in Figure 1 shows that the rate of increase of the share of women at the top of the income distribution has been smaller

\(^9\) Results based on tabulated data are obtained using linear interpolation to have the gender breakdown and, later, the income decomposition by sources. Where the tabulated data for the UK are used (2011, 2012 and 2015), the relevant top percentile is calculated applying a Pareto interpolation to the whole distribution (male and female); the overall percentile is then used to calculate the number of women by applying a Pareto interpolation to the distribution for women alone. A sensitivity analysis was conducted on a subset of data points available for the UK, New Zealand and Australia. This exercise revealed that linear interpolation yields statistics that are very close to the real figures (computed from micro data or by the data provider) when the distance between the income ranges is quite small, which is indeed the case in New Zealand and Australia, or at the very top of the income distribution in the UK. When income ranges are broader the Pareto method provides more accurate results, and we opt for it in the case of the UK.
at the higher ranks. In other words, the improvement in the presence of women at the top in general does not extend to the very top: as a result, the gradient with income has become more marked in most countries. The under-representation of women today increases more sharply as one moves up the income scale. This tendency is consistent with the evidence reported for top earnings, as mentioned earlier. We observe that in Spain, there has been an increase in the share of women in the top 0.1 per cent, with the exception of the last two years. In Canada, the increase began only after 1997. In Denmark, there has been little increase in the top 0.1 per cent during the last 10 years. In the case of Norway, there was a slight increase in the proportion of women in all percentiles examined (before and after 2005), albeit dampened in the top 0.1 per cent. In the UK, for the top 0.1 per cent there is little sign of an increase in women’s representation over the period 1995 to 2013. We see a slight increase at the very end of the period, in 2014 and 2015. The same is true in Italy since 1999. The study by Boschini, Gunnarsson and Roine (2017) on Swedish data also finds that the increase in the share of women is smaller at the very top of the income distribution. Australia is the only country in our analysis where the increase of the share of women at the top 0.1 per cent is more marked than at other top percentiles. Income splitting may be particularly important in understanding what is going on in Australia, as discussed in Stewart, Voitchovsky and Wilkins (2017).

Overall, despite the wide differences in gender employment and wage gaps across the countries considered, this evidence highlights that they share rather similar patterns at the top of the income distribution. In Section 5 we will attempt to address the reasons for these commonalities.

The historical record goes back furthest in the case of New Zealand and Canada.\(^{10}\) In New Zealand, the data from 1953 show, first, the very low representation of women in the top income groups at the beginning of the period: around 7 per cent of the top 1 per cent and around 5 per cent of the top 10 per cent, see Figure 2, Panel A. The proportion remained consistently low until the mid-1970s, when the percentage of women began to rise. The proportion of women in the top 1 per cent and in the top 10 per cent reached 16 per cent and 23 per cent, respectively, in 1989. Secondly, the mid-1970s saw an inversion of the ranking of the two curves. At the outset, in the 1950s, the proportion of women was higher for the top 1 per cent than for the 10 per cent. There was then a reversal in the mid-1970s, so that there are now more women in the top 10 per cent than in the top 1 per cent. The results for Canada for the period 1942-1990 are shown in Figure 2, Panel B. The proportion of women appears to have been falling in

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\(^{10}\) A comparison between the shares computed on historical and recent data sources for overlapping years is reported in Figures A6 and A7 in Appendix 2 for Canada and New Zealand. Historical top percentiles for New Zealand and Canada are calculated applying a Pareto interpolation to the whole distribution (male and female); the overall percentile is then used to calculate the number of women by applying a Pareto interpolation to the distribution for women alone.
the 1940s and it began to rise at the end of the 1960s. In the 1960s, the proportion of women seems to have been similar across the top groups, from the top 10 per cent to the top 0.5 per cent, but in the 1940s the proportions were higher for the very top group. This is particularly marked for 1942, when women accounted for nearly 20 per cent of the top 0.01 per cent, but only 5 per cent of the top 10 per cent, with a pattern which resonates the one in New Zealand for the earlier period of observation. The reversal in the share of women as one moves up the income scale is a notable fact which our historical data allow to identify: in the past, the few women accessing the top were positioned at the high end of the distribution.

The figures presented examined trends in the share of women in the top percentiles of the income distribution, where total income excludes capital gains, whenever possible. Does the inclusion of capital gains deliver a different picture? In countries in which capital gains can be identified separately in the data (Australia, Canada and Spain), including capital gains in total gross income appears to have little effect on the share of women in the top 10 per cent or top 5 per cent (see Figures A2, A3 and A5 in Appendix 2). Including capital gains, however, tends to raise the share of women at higher percentiles. This increase is particularly marked in Spain and Australia and generally for the years before the crisis. A similar trend is observed in the data for Denmark where capital gains and dividends are identified jointly (see Figure A4 Appendix 2). In Norway, the measure of total income used in the analysis includes some capital gains. Excluding these capital gains has little effect on the reported share of women in top income.

Summarising, the share of women has generally risen over time in all the countries considered, the less so at the very top of the income distribution. While women have improved their representation at the top of the income distribution, their presence at the top 10 per cent has stalled in many countries after 2009 with the start of the financial crisis. There is evidence that the latter has hit men more harshly than women in the labour market, especially in Spain and Italy (see e.g. Dolado, García-Peñalosa and Tarasonis, 2018). Women at the top of the income distribution, however, have lost ground compared to men in many countries.

4. The shape of the distribution and the glass ceiling

The labour economics literature tends to speak of the presence of a glass ceiling in earnings as the data systematically exhibit an increasing wage gap (defined in logs) between men (m) and women (w) in the upper tail of the earnings distribution; see, amongst others, Albrecht, Björklund and Vroman (2003), Arulampalam, Booth and Bryan (2007) or Blau and Kahn (2017). In other words, earnings rise less steeply for women than for men. In our context, we would like to know how fast the share of women is declining as one moves up the income distribution. From the charts in Figure 1, such a decline is observed in most countries with the share of women being lower at higher percentiles. The aim of this section is to try to quantify the importance of this decline using the Pareto distribution as a
tool to study the very top of the income distribution. In other words, we investigate the presence of a gender divide in incomes by fitting separate Pareto distributions for men and women in the upper tail of the distribution. We can then compare the slopes of the curves estimated on the male and female sub-samples to evaluate how much faster than men women are disappearing from the top of the distribution.

Writing the cumulative distribution function of income $y$ as a Pareto, we have

$$1 - F(y) = A_i y^{-\alpha_i}$$

(1)

where $i = m$ or $w$, with $\alpha_i > 1$ indicating the Pareto coefficient. The number of individuals whose income is above the threshold $y$ - left hand side of equation (1) - is equal to a constant, multiplied by the threshold $y$ itself, to a power which is labelled Pareto coefficient - right hand side of (1). Taking logs and rearranging, equation (1) can be rewritten as

$$\ln y = C_i + \frac{1}{\alpha_i} \ln \frac{1}{1 - F},$$

(2)

where $C_i = \frac{1}{\alpha_i} \ln A_i$ is a constant.

Equation (2) shows the gradient in (log) income as one moves up the distribution, and the difference in the gradient $1/\alpha_i$ between men and women can be taken as a measure of the extent to which there can be said to be a glass ceiling, where $1/\alpha_w < 1/\alpha_m$, or $\alpha_m / \alpha_w < 1$ then the distribution of income dies away faster for women. In other words, the ratio between the Pareto coefficients $\alpha_m / \alpha_w$ can be used as a measure of how concentrated the distribution of income for men and women is at the top. Alternatively, the ratio of women to men in the income group with $y$ or more falls with $y$ according to $A_w / A_m \cdot y^{-(\alpha_m - \alpha_w)}$: considering that the number of men and women declines as we move up the income distribution, the larger the difference $\alpha_w - \alpha_m$, the faster the disappearance of women from the upper tail of the distribution compared to men. Here we use the ratio between the Pareto coefficients for men and women, $\alpha_m / \alpha_w$, as a measure of the glass ceiling. A ratio smaller than 1 implies that women disappear faster than men from the top of the distribution, while a ratio larger than 1 implies that women are disappearing more slowly than men at very high percentiles, although there may be fewer women than men at the top in both cases.

Figure 3 about here

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11 This is done for instance in Atkinson, Piketty and Saez (2011) and Veall (2012). Jones (2015) discusses how Pareto distributions for income and wealth data can be generated and studies the economic forces which affect top income inequality over time and across countries. We here exploit the Pareto distribution to investigate gender inequality at the top.
The Pareto curves and equations for the top 1 per cent in the UK are shown in Figure 3, Panel A for 1995 and Panel B for 2014.\textsuperscript{12} The vertical axis shows the log of income spanning from the minimum income level required to be in the top 1 per cent that year to the maximum income threshold considered. This is usually the highest income threshold provided in tabulated data or, in the case of the UK, the income of the top 0.1 per cent as in some years there are too few (unweighted) observations for women beyond that point. The horizontal axis represents a transformation of the number of men and women with incomes at least as high as the thresholds - with more people on the left and less people on the right. The fact that the curve for women is on the right of the curve for men tells us that there are fewer women than men at each income level, and the fact that the slope is flatter tells us that they are disappearing faster as income increases. A parallel curve to the right would instead be interpreted as implying that there are fewer women at each income level but that their proportion remains fixed all the way up the income distribution.\textsuperscript{13} In both sample years, we find that the slope is less for women than for men, implying that the Pareto coefficient for women is greater. In this sense, the upper tail is less concentrated for women. The slope for women appears to be slightly steeper in 2014 than in 1995, whereas that for men has become remarkably steeper. This suggests that the glass ceiling in terms of income in the UK has become more apparent. The income gradient has steepened for men leaving women further behind.

Is such a pattern found in other countries? Figure 4 report the ratio of the male to the female Pareto coefficients $\alpha_m / \alpha_w$ for the countries for which we have data. Focusing on the very top of the distribution first, Figure 4, Panel A, shows the ratio of slopes computed on the respective male and female populations in the top 1 per cent of the distribution. This was possible with data for Denmark, Italy, Norway, and the UK. Figure 4, Panel B shows historical data for Canada (1942-1990) and New Zealand (1953-2015) together with more recent data series starting on or after 1980 for the other countries. The coefficients in Panel B were computed on the top 10 per cent of the income distribution in Canada and on the top 5 per cent in all the other countries.

Figure 4 about here

\textsuperscript{12} Given the constraints imposed by the size of the samples in earlier years, Pareto coefficients for the UK are based on cumulative data points covering the top 0.1 down to the top 1 percent. This is to ensure that no data points are based on less than 20 (unweighted) individual observations. The Pareto coefficients are computed using equation (2). Regressing instead $\ln(1/(1 - F))$ on $\ln y$ gives coefficients, which are close to those in Figures 3, Panels A and B. For example, the coefficient for men is 0.4767 in 1995 and that for women is 0.4599. In 2014, the coefficient for men is 0.5924 and that for women is 0.4733.

\textsuperscript{13} Note that, everything else being equal, an increase in the number of women at the bottom of the top 1 per cent and no increase higher up the distribution would tilt the Pareto curve, making the glass ceiling more marked.
The first general impression that comes from these figures is that all the curves trend downwards over time. This trend is apparent both when the coefficients are computed on the top 1 per cent (Figure 4, Panel A) and on the top 5 per cent (Figure 4, Panel B). In addition, there is a reversal of the ratios for men and women in some of the countries. For Canada, Panel B shows that in the 1940s, the gradient (computed on the top 10 per cent) was steeper for women but by the late 1960s it had become less steep and remained consistently so. We observe a similar reversal in New Zealand. In the mid-2000s, the ratio reaches its minimum. Also Denmark (Panel A) displays a pattern in the Pareto coefficients which resembles the one of Canada and New Zealand in earlier years, with the coefficients for women being smaller than those of men until the early 2000s, when curves first overlap and then switch, indicating the appearance of a glass ceiling, which has become more severe over time. In Norway, the lines for men and women cross several times between 1993 and the mid-2000s. This trend echoes the pattern of curves for the share of women in the top 1 per cent and top 0.1 per cent in Panel F of Figure 1.

We see that, from the mid-2000s, women disappear faster than men from the top of the distribution in all countries. Perhaps with the exception of Australia, this phenomenon has become more marked over time, indicating that the glass ceiling has become stronger. This trend is in part driven by the fact that the share of women has been increasing much more at the lower rather than the top end of the top of the distribution in these countries, see Figure 1. In the last few years of data, however, we observe a small improvement in terms of the glass ceiling in several countries. It will be interesting to see if this trend continues in the coming years.

Once established the extent and the evolution of the gender divide at the top, we seek to explain the changing slopes over time and the switch in the steepness of the male and female Pareto curves. A natural first step in this direction is to consider the composition of income. The changing pattern of gender gaps in income concentration at the top may reflect what is happening to the distribution of earned incomes: this factor takes us back to the literature on the evolution of the gender wage gap. The literature cited in the Introduction and previous sections focuses on the labour market and identifies different explanations for women’s under-representation at the top of the earnings distribution. The shift in Pareto coefficients may also result from changes in the distribution of investment income and the underlying concentration of wealth. A third reason for the changes in the extent of the gender divide at the top could be the changing balance between earned income and investment income. Is there a difference in income composition between men and women? How has income composition evolved over time? This is an important and little known aspect of the gender dimension of top incomes that we explore in the next section.

5. Gender and the composition of top incomes

In this section, whenever possible, we consider the breakdown of total gross income into three main components: earned income, self-
employment income and investment income. Earned income includes employment income, pension income and government transfers. Investment income includes income sources like interests, dividends and (imputed) rents, when taxed via personal income tax. Self-employment income also includes business income when taxed via the personal income tax. The aim of this section is to document the evolution of the composition of top incomes by gender. We look at the income composition of men and women within the top 1 per cent, defined on the total population. \(^{14}\)

Figure 5 about here

We start from the historical data for New Zealand. Here, we can make use of the separate distributions given according to the principal source of income, available for the earlier period. The top 1 per cent in 1953 (those with incomes above $2,818 a year) contains 14,323 people, of whom 1,013 were women (7 per cent). \(^{15}\) The main source at this time was self-employment (78 per cent), with 18 per cent receiving salary or wages as the main source. Only 4 per cent had investment income as the main source. This is important, since women were poorly represented among the other two groups: they constituted 1.7 per cent of those with wages and salaries, and 5.5 per cent of the self-employed. In contrast, as Figure 5 shows, among those with investment income as the main source they constituted a majority (63 per cent). In fact, women made up more than 60 per cent of this group throughout the top 10 per cent of total income recipients. As a result, a large proportion of the women in the top income ranges had investment income as their principal source: 71.4 per cent of the top 1 per cent in 1953.

The dominance of women among those with investment income in New Zealand was however declining over time, as is also demonstrated by Figure 5. By the 1970s, the proportion of women was below 50 per cent and this was not compensated by a rise in representation among the other two groups. In 1975, when the top 1 per cent contained 21,960 people, the proportion with wages and salaries as the main source had risen to 49 per cent, but among these only 2.5 per cent were women. The low share of women in the top income population among those with earned incomes up to the mid-1970s is in line with other evidence that there was little change in the gender distribution over this period. Martin (1997, Table 6) calculated the median total incomes of women actively engaged in the labour market aged 15 to 59 in each of the quinquennial censuses. As a percentage of the male median, the median incomes of women were 51.2 per cent in 1951 and 52.0 per cent in 1970, but then increased to 56.2 per cent in 1981 and 67.1 per cent in 1991. The decline in the importance of women among those with investment income and the absence of a corresponding rise in their share among those with earned incomes could explain the reversal in the ranking of the shares of women at the top of the

\(^{14}\) Associated statistics are reported in Online Appendix 2.

\(^{15}\) Although at that time it would have been £1,409. New Zealand switched from pounds to dollars on 10 July 1967, at the ratio of £1 = $2.
income distribution in New Zealand in the mid-1970s, as explained in the previous two sections.

Table 2: Income composition of people in the top 1 per cent, by gender, 2013, various countries

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th></th>
<th>Women</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Earnings</td>
<td>Investment income</td>
<td>Self-empl. income</td>
<td>Earnings</td>
</tr>
<tr>
<td>Australia</td>
<td>66.7</td>
<td>20.5</td>
<td>10.8</td>
<td>45.9</td>
</tr>
<tr>
<td>Denmark</td>
<td>57.4</td>
<td>11.7</td>
<td>30.9</td>
<td>51.1</td>
</tr>
<tr>
<td>Italy</td>
<td>59.3</td>
<td>8.7</td>
<td>31.9</td>
<td>47.2</td>
</tr>
<tr>
<td>Norway</td>
<td>54.4</td>
<td>32.9</td>
<td>12.7</td>
<td>42.7</td>
</tr>
<tr>
<td>Spain</td>
<td>78.4</td>
<td>10.5</td>
<td>11.2</td>
<td>61.7</td>
</tr>
<tr>
<td>UK</td>
<td>68.0</td>
<td>13.3</td>
<td>18.8</td>
<td>59.4</td>
</tr>
</tbody>
</table>

For countries other than New Zealand, information on the source of income covers only more recent decades. Table 2 gives a snapshot of the income composition in 2013, the last year for which data is available for a subsample of the eight countries we consider. Differences in income definitions across countries means that comparisons across countries should be taken with caution. Nevertheless, the importance of investment income as a source of income for women compared to men at the top is common to all the countries examined.

In 2013, the share of income from earnings for women is close to 90 per cent of the share of earnings for men in Denmark and the UK. In Spain, Norway and Italy the share of income from earnings for women is relatively lower, at about 80 per cent of the share of men, and about 70 per cent in Australia where the share of investment income for women is as large as the share of earnings. In Norway, women in the top 1 per cent receive about 45 per cent of their income from investment, comparable to the share reported in the Australian data, although income composition for women at the top in Norway is closer to the composition of men in the top 1 per cent than in Australia. Note that data on decomposition for Norway is only available for 2013.

16 For example, the distinction between self-employment income and investment income is not always clear-cut. In the case of Australia, some income labels on the tax return may contain both types of income. One prominent example is income derived from partnerships and trusts. This distinction is important here, as income from partnerships and trusts can be appreciable. In this study, income from partnerships and trusts in Australia has been distributed between investment and self-employment based on information provided in the sub-labels of the tax form.
Looking at the evolution of income composition over time reveals that share of earnings has been growing for both men and women but that in many countries women’s share of income from earnings has been growing faster than for men. Panels A and B in Figure 6 show the composition of income of the top 1 per cent by the three categories of income in Australia, and for men and women separately. The aforementioned dominance of investment income is particularly strong throughout the period, with women in the top 1 per cent receiving about 50 per cent of their income from investment from 2000 to 2014. The corresponding figure for men varies between 20 and 30 per cent, with earned income covering up to 70 per cent of overall income. Panels C and D in Figure 6, besides highlighting the importance of investment income for women compared to men, show that self-employment income plays a more important role both for men and women in Denmark compared to Australia. Earned income becomes more prominent for women towards the end of the observation period. In Italy, the investment income share is smaller - around 15 per cent from 2004 onwards - compared to the other countries examined, but is again higher for women than for men- see Panels E and F, Figure 6 - whereas the share of self-employment income is relatively similar across gender. The share of earned income has risen considerably for women in Italy. Even larger changes in composition are shown for Spain in Panels G and H. The share of investment income is larger for women than for men, as is that of self-employment income. Over time, there has been a marked rise in the share of earned income for women, at the expense of the other two categories.

Panels I and J in Figure 6 show the composition of income of the top 1 per cent for the UK, for men and women separately. Taking the period 1995 to 2014 as a whole, the main conclusion is that women have rather more investment income and less earned income, with the proportion from self-employment being similar for men and women. In 2014, for example, women received 23 per cent of their income from investments, whereas for men the figure was just below 15 per cent. The composition of investment income is also different between men and women. Between 2004 and 2014, men tended to have relatively more investment income in the form of dividends and income from (UK or overseas) properties. In contrast, women had a relatively higher share of their investment income from interests (interest from UK banks, building societies and other deposit takers) and “other” investment sources. Other investments include interests from National Savings products, securities, partnerships and from trusts, and settlements and estates. The different investment income composition of men and women suggests that men and women have different portfolio compositions. The bigger importance of dividends for men may indicate that men at the top of the income distribution opt for more risky investments or

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17 This can partly be related to the fact that most investment income - non-qualified dividends, interests and non-qualified capital gains - in Italy is taxed via a withholding tax and does not enter personal income taxation.

18 Note that imputed dividends and interests may appear in other investment income.
that a larger part of their (labour) compensation is paid out in equity shares, which is consistent with evidence for the US in Albanesi, Olivetti and Prados (2015).

In line with the evidence for other countries, data for Canada reveal that women in the top 1 per cent have a higher share of their income coming from non-wage sources than men. While the relative importance of wages and salaries has been growing for men and women between 1993 and 2015, wages remain a larger source of income for men in the top 1 per cent (Figure 6, Panel K). By 2014, wages and salaries (alone) represented about 68 per cent of men’s income in the top 1 per cent compared to about 50 of women’s income.

Although the share of earned income has tended to increase for both men and women over time, non-earned income - and investment income in particular - plays an important role for women at the top in all the countries considered. Why do women receive a larger, though declining, share of their income from investment compared to men, in all countries? How does this pattern relate to the evolution of female presence at the top of the income distribution? Several factors could be mentioned.

The larger share of income from investment reported for women could in part be explained by differences in the age composition of the male and female samples in top percentiles. Relatively more women than men in the top 1 per cent are aged 65 and over. Over time, there has been a tendency for the share of older women to decline at the top and the share of older men to rise, but older women remain over represented at the top 1 per cent. In the UK, for example, the share of men aged 65 and over in the top 1 per cent increased from 5 to 9 per cent between 1995 and 2014. Over the same period, the share of women aged 65 and over in the top 1 per cent declined from 16 to 11 per cent. Age composition, however, is unlikely to be the only factor contributing to the systematic gender differences in income composition and changes over time that we observe. The share of investment income in the top 1 per cent is also higher for women than men of working age in the UK (20 and 13 per cent, for women and men respectively, in 2014) and Australia (37 and 17 per cent, for women and men respectively, in 2014), for which we have data.

Another explanation points to the structure of the tax system: if women tend to be the secondary earner in the household, there can be incentives to attribute some income from investment to the woman, in order to minimize the overall tax burden of the household. This incentive should be stronger in countries, or periods, in which the degree of progressivity of the tax system is higher or female earned income is lower.

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19 These trends are based on data available at the time of writing that is for Australia, Spain and the UK.
20 We point out that couples can take joint decisions not only on the allocation of investment income but also on the extensive and intensive margin of the labour supply in order to minimize the tax burden.
An increase in women’s earnings would leave less room for such transfers to be tax efficient. The increase in female labour force participation over the time period covered by our analysis is consistent with weakened incentives to income transfers within the family. A reduction in progressivity would generate similar effects. A straightforward – though admittedly rough – measure of progressivity is the top marginal personal income tax rate. According to OECD data on central government personal income tax rates, all countries considered experienced a decline in the top marginal tax rate over the period considered, with the exception of the UK which shows an increase between 2010 and 2012, and then a decrease again. The amount of income that can be transferred for tax purposes within the household will also depend on the limits imposed by the tax system and vary between countries. Such tax incentives are likely to contribute to the trends observed in Australia, for example (e.g. Stewart, Voitchovsky and Wilkins, 2017).

Assortative mating could also be a contributing factor. If high earning women are more likely than high earning men to have a high earning partner, then they will tend to live in households with high savings and ensuing investment income. For example, Boschini, Gunnarsson and Roine, (2017) report that about 75 per cent of married men in the top 1 per cent of the income distribution in Sweden have a wife with an income outside the top 10 per cent. In contrast, 75 per cent of married women in the top 1 per cent have a husband in the top 10 per cent. Evidence for Australia and Italy points in the same direction: Fiorio and Verzillo (2018) report that there are gender differences in income assortative mating as the share of top 1 per cent newly-wed males who get married to a top 10 per cent woman is equal to 30 per cent, whereas the top 1 per cent newly-wed females who get married to a top 10 per cent man is equal to 53 per cent.

Shifts in the way assets are held may also influence the composition of top incomes. A declining share of investment income may reflect changes in the way households organise their wealth holdings. For instance, Fremeaux and Leturcq (2016) look at the individualization of wealth as a factor explaining the increase in the gender wealth gap in France.

5. Conclusions

This paper provides new evidence on gender disparities adopting a measure of inequality between genders which has not been used before. This work complements, on the one hand, the literature on top incomes which overlooks the gender dimension. On the other, it addsto the literature on gender gaps in earnings which generally provides information on differences in income from labour but is silent on the other income components. These are likely to contribute to the overall picture of gender inequalities. In countries with independent taxation of couples, it is

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21 This is used for instance in Alvaredo, Atkinson, Piketty and Saez (2013) to correlate the changes in concentration of top income shares with changes in progressivity of the tax system.
possible to investigate the proportion of women in the top income groups. In this paper we have focused on eight countries for which this information exists.

The paper casts light on four questions. The first is the existence of the gender divide, which we have seen to be marked and to exist to a broadly similar extent in all countries examined. Women are seriously under-represented in the top income groups and the degree of under-representation increases as one approaches the top. Women account for under a quarter of those in the top 1 per cent of incomes. The second question concerns the changes over time. The female presence in the top of the distribution has increased in recent years in all the countries considered, (apart from in Australia), but less in the upper ranges. In Italy and the UK, there is little sign of an increase in women’s representation in the top 0.1 per cent. As a result, the gradient with income has become more marked: the under-representation of women today increases more sharply as one moves up the income scale compared to the past.

The third question concerns the slope of the upper tail, as represented by the Pareto coefficient, which we use as a measure of the glass ceiling at the very top of the income distribution. For Australia, there is little difference between the slopes for men and women. For Italy and – particularly the UK - there is a marked difference, with incomes for women rising less than for men, especially in the more recent years, indicating a thickening of the glass ceiling. In Denmark and Norway, a glass ceiling (at the top 1 per cent) developed in the mid-2000s. The gradient for women was, instead, steeper in most or all previous documented years. In Canada and New Zealand a similar shift happened much earlier, with women having a steeper slope up to the late 1960s in both countries. This may have reflected the changing composition of income, which is the fourth question addressed in the paper. We uncovered that investment income is a particularly important source of income for women at the top compared to men, with self-employment income playing a similar role for men and women, and earned income compensating the difference in importance of investment income. We look at demographics, both in terms of ageing and mating patterns, changes in the tax structure, in female labour force participation and in wealth holding as potential explanations for the changing composition of income and for how these changes feed into the dynamics of female presence at the top.

We can only point to these different explanations, rather than assessing which of them plays a more important role in influencing the trends we observe. The nature of our data and the comparative character of our analysis prevent us from drawing conclusions specific to each country and to pin down more precisely the reasons behind differences and similarities across them. However, this discussion and the evidence uncovered in this study underline why it is important to look at income as a whole when seeking to understand the sources of gender inequality and lays the groundwork for future research.
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Statistics Canada, 2017b, Table 204-0001 - High income trends of tax filers in Canada, provinces, territories and census metropolitan areas (CMA), national thresholds, annual (percent unless otherwise noted), CANSIM (database). (last accessed: 26 Jan 2018)


Figure 1: Share of women in top income groups

Panel A: Australia, 2000-2014

Panel B: Canada, 1993-2015

Panel C: Denmark, 1980-2013

Panel D: Italy, 1999-2015
Note: detailed sources are reported in Appendix 1 and data in Online Appendix 1.
Figure 2: Share of women in top income groups, historical data

Panel A: New Zealand, 1953-1989

Panel B: Canada, 1942-1990

Note: detailed sources are reported in Appendix 1 and data in Online Appendix 1.
Figure 3: Pareto curves for the UK - top 1%

Panel A: 1995

Panel B: 2014

Note: Authors’ computations on data from the Survey of Personal Incomes. The cumulative distribution function of income \( y \) as a Pareto can be written as \( 1 - F(y) = A_i y^{-\alpha_i} \), where \( i = m \) or \( w \), \( A_i \) is a constant and \( \alpha_i > 1 \) indicates the Pareto coefficient. Taking natural logarithm and rearranging, we obtain

\[
\ln y = C_i + 1/\alpha_i \ln 1/(1 - F),
\]

which is plot in the figure (see equations 1 and 2).
Figure 4: Ratios of women’s to men’s Pareto coefficients

Panel A: top 1%, 1980-2015

Panel B: top 5% and top 10% for Canada, 1942-2015

Note: authors’ computations on data from various sources, see Appendix 1 for details.
Figure 5: Women as per cent of those with investment income as main source - New Zealand

Note: data from New Zealand Inland Revenue, see Appendix 1 for details.
Figure 6: Composition of total income by gender, top 1%

Panel A: Australia 2000-2014, women

Panel B: Australia 2000-2014, men

Panel C: Denmark, 1980-2013, women

Panel D: Denmark, 1980-2013, men
Panel E: Italy, 2000-2015, women

Panel F: Italy, 2000-2015, men

Panel G: Spain, 1999-2013, women

Panel H: Spain, 1999-2013, men
Panel I: UK, 1995-2014, women

Panel J: UK, 1995-2014, men

Panel K: Canada, 1993-2015, men and women

Note: detailed sources are reported in Appendix 1 and data in Online Appendix 2.
Appendix 1: Detailed information on sources

Australia
Data source: Australian Tax Office (ATO)
Data format: customised tables for 2001/02 to 2014/15 and tabulated data, 200 income ranges per year.
Population coverage: whole population of individual taxpayers with positive net tax.
Definition of total income: figures are based on total individual income before tax (adjusted for deferred losses) excluding capital gains and imputation credits. Due to data constraints, the Pareto analysis is conducted on total income excluding capital gains only. Figures A1 and A2 in Appendix 2 reports the share of women in top incomes in Australia based on total individual income excluding capital gains only and the share of women in top incomes including capital gains and imputation credits.
Tax year: ends 30 June; labelled with the year of starting month
Other information: more than 70 per cent of tax returns are filled with the help of a tax agent. The proportion is increasing with individual income, reaching 85 per cent or more for the top 5 per cent (top 5 per cent figures based on data from the 1-2 per cent micro samples).

Canada
Data source: Statistics Canada
Data format: tabulated data from official publications from 1942 to 1990. Figures computed by Statistics Canada based on the Longitudinal Administrative Database (LAD) from 1993 to 2015. LAD figures were downloaded from the Statistics Canada website.
LAD population coverage: The LAD is a 20 per cent random sample of Canadian tax filers.
Definition of total income in LAD: total individual income before tax (the market income plus government transfers and refundable tax credits) not including capital gains
Tax year: calendar year
Other information: Figures on top percentiles from the LAD are computed with respect to the population of tax filers and not the population aged 20 and over (reference population used in the top income literature for Canada). The population of tax filers has increased over time. In the mid-80s, its size was about 85 percent of the size of the population aged 20 and over. From 1993 onwards, the number of tax filers represents more than 95 percent of the population aged 20 and over. This is the reason why we opted to consider Statistics Canada LAD data from 1993 onwards. Figures going back to 1982 are available on the Statistics Canada website. A chart that highlights how the historical series (based on tabulated data) and the LAD data series compare over time is reported in Figure A6 in Appendix 2.
Denmark
Data source: Statistics Denmark
Data format: micro data from 1980 to 2013
Population coverage: whole population of individual taxpayers, aged 15 and above
Definition of total income: total individual income before tax (market income + government transfers) excluding dividends and capital gains. Dividends and capital gains could only be identified jointly. The treatment and coverage of capital gains changed over the years but is included the data from the mid-2000s. We are grateful to Jakob Søgaard for pointing this out. As a result, the series that excludes capital gains is likely to provide a more reliable picture of the evolution of total income over 1980 to 2013. The series with capital gains should be more accurate regarding the level of total income at the end of the period.
Tax year: calendar year

Italy
Data source: MEF-Department of Finance
Data format: tabulated data from 1999 to 2015, 33-34 income ranges per year.
Population coverage: whole population of individual taxpayers
Definition of total income: total individual income before tax
Income sources not included or covered: Dividends and capital gains are not covered unless received from qualified participation in a listed firm. Interest income not included. Dividends distributed by non-listed companies are included via the fiscal declaration of firms.
Top coding or grouping: when frequency is less than 4 units, data are omitted for privacy reasons
Tax year: calendar year
Other information: in 2012 imputed rents pertaining to the house where the owner lives (redditi fondiari derivanti da beni non locati) are excluded from total income before taxation. From 2011, there was the option to pay a withholding tax on income derived from renting a house (rather than the progressive personal income tax). Starting from 2009 there is a 10 per cent withholding tax on wages coming from extra-time. To subtract this income component from progressive taxation, there is a wage limit of 35000 increasing to 40000 euros.

New Zealand
Data source: New Zealand Inland Revenue
Data format: published tabulated data for most years between 1953 and 1989 (see Atkinson and Leigh, 2007b) and tabulated data provided by the Inland Revenue from 1980 to 2015, with 52 to 172 income ranges per year. A chart that highlights how the historical and recent data series compare over time is reported in Figure A7 in Appendix 2.
Population coverage: the recent tabulated data is based on a random sample of individual taxpayers, scaled up to population estimates. The sample is 2 per cent of wage and salary earners and 10 per cent of IR3 filers. Data from 1981 to 1993 include people who filed income tax
returns. People were not required to file tax returns if their income was below a specified threshold unless they had income sources from which withholding taxes had not been deducted. The data from 1994 onwards also include non-filers with PAYE income. The income data for such non-filers is sourced from employer-records, including taxable transfers.

Definition of total income in recent tabulated data: total taxable individual income. Note that there are very few allowances available.

Tax year: ends 31 March - labelled with year of starting month

Other information: Gender identification in the recent tabulated data is based on the person’s title, as a proxy variable (random allocation of people with titles like Dr, Reverend, etc.). Structural break in 2000 when the top personal income tax rate was increased and the trust rate was not, resulting in many individuals channelling their income through trusts. The two rates were realigned in 2012, although ownership structures are likely to remain.

Norway
Data source: Statistics Norway
Data format: Micro data from 1993 to 2013. Files of taxpayers linked to population registry
Population coverage: entire population
Definition of total income: Total individual income before tax (includes some capital gains), see Aaberge, Atkinson and Modalsli (2016) and Aaberge and Atkinson (2010). Note that due to data constraints the definition of total income used in the time series is not exactly the same as the definition of total income used in the income composition analysis for 2013. There was also a change in the definition of income in 2005, which may affect the time trends observed in the data.
Income sources not included or covered: income from owner-occupied houses and non-taxable capital gains
Tax year: calendar year
Other information: tax changes on dividends in 2001 and 2006 affected the income reporting behaviour of capital owners and trends in investment income during the period from 2000 to 2013, see Aaberge, Atkinson and Modalsli (2013).

Spain
Data format: Data for 1999-2001 comes from the "Panel de Declarantes de IRPF 1999-2009" which is a stratified random sample (panel) covering 2 per cent of taxpayers. Data for 2002-2013 comes from the "Muestra de Declarantes de IRPF", which is stratified random sample that includes 6 per cent to 8 per cent of individual taxpayers. From 2002 onwards, the Muestra is used as it performs better when reproducing tabulation-based top shares. The Panel loses precision with time. Panel sample size about 390,000 to 425,000; Muestra sample size about 907,000 to 1,352,000
Definition of total income: total individual income before tax, excluding capital gains.
Income sources not included or covered: Capital gains are covered at varying degrees.

Tax year: calendar year

Other information: married couples can choose to file their tax returns jointly. When there is joint filing, it is not possible to distinguish the incomes of the members of the couple separately. In those cases, the micro-data base identifies only the gender of the individual with highest incomes in the couple. When both members of the couple have non-zero incomes, the joint filing is clearly disadvantageous, the more so for relatively high incomes. Around 20 per cent of the tax returns in the top 10 per cent and top 1 per cent of the income distribution are joint. We have considered that all joint files at the top of the distribution are individual (so one of the members in the couple has zero or very little income), and attributed them to the member of the couple with highest incomes, as done in the micro-data base.

Throughout the period, 90-95 per cent of joint tax returns in the top 1 per cent group (and 80-90 per cent in the top 10 per cent group) correspond to men. It should also be noted that a small fraction of joint files corresponds to sole-parent families.

United Kingdom
Data source: HMRC, Survey of Personal Incomes (SPI)

Data format, year and sample size: data for 1995/96 to 2010/11 and for 2013/14 to 2014/15 are drawn from micro dataset of the Survey of Personal Incomes (no data were released for 2008/9). The figures for 2011/12, 2012/13 and 2015/16 are based on interpolations of the published tabulations of the Survey of Personal Incomes. Where the tabulated data for the UK are used, the relevant top percentile is calculated applying a Pareto interpolation to the whole distribution (male and female); the overall percentile is then used to calculate the number of women by applying a Pareto interpolation to the distribution for women alone.
Sample size: 57,400 to 729,300 observations per year in the micro data, 13-14 income ranges for the tabulated data. Note when using the micro datasets, data points based on less than 20 (unweighted) individual observations are not considered in the analysis.

Population coverage: representative sample collected from 3 different sources: (1) the National Insurance and PAYE Service, (2) the Computerised Environment for Self-Assessment system which covers people with self-employment, or people who receive rental or untaxed investment income, and (3) the Claims system, which covers people who are not generally taxpayers but who have had too much tax deducted at source and have made a claim for its return.

Definition of total income: total individual income before tax

Income sources not included or covered: some social security benefits and income from some tax efficient savings vehicles that are not taxed. Capital Gains arising from the disposal of assets are subject to Capital Gains Tax (CGT) and are not treated as income for income tax purposes, so gains from the disposal of assets are not included in the SPI. Some investment income is imputed.
Top coding or grouping: in the micro datasets, the richest individuals are grouped into composite records.

Tax year: ends 5th April - labelled with the year of the starting month.

Other: Independent taxation was introduced in the UK in 1990.

“In March 2009, it was announced by the Labour Government that the top rate was to be raised from 40 to 50 per cent with effect from April 2010, and this led to “considerable fore-stalling” of income in 2009-10 (Seely, 2014). In March 2012, it was announced by the Conservative Government that the top rate was to be reduced to 45 per cent with effect from April 2013, which again provided an incentive for income to be moved between tax years, in that case from 2012-13 to 2013-14.” Atkinson and Ooms (2015), p 1.
Appendix 2: additional figures

Figure A1: Australia, share of women in top income groups, total income excl. cap. gains only, 2000-2012

Note: see Appendix 1 for details.

Figures A2: Australia, share of women in top income groups, total income incl. capital gains and imputation credits, 2000-2012

Note: see Appendix 1 for details.
Figure A3: Canada, share of women in top income groups, total income incl. capital gains, 1993-2015

Note: see Appendix 1 for details.

Figure A4: Denmark, share of women in top income groups, total income incl. dividends and capital gains, 1980-2013

Note: see Appendix 1 for details.
Figure A5: Spain, share of women in top income groups, total income including capital gains, 1999-2013

Note: see Appendix 1 for details.

Figure A6: Canada, comparison with LAD (dashed lines) 1980 to 1995

Note: data for the LAD series starting in 1982 are included for comparison. We are considering LAD data from 1993 onwards. See Appendix 1 for details.
Figure A7: New Zealand, comparison with historical data (solid lines) 1975 to 1992

Note: see Appendix 1 for details.
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