Journal of Corporate Finance 71 (2021) 101857

Contents lists available at ScienceDirect

Journal of Corporate Finance

journal homepage: www.elsevier.com/locate/jcorpfin

The role of employer learning and regulatory interventions in mitigating executive gender pay gap

Swarnodeep Homroy, Shibashish Mukherjee *

University of Groningen, Groningen, The Netherlands

ARTICLE INFO

JEL codes:
J31
G34
G38

Keywords:
Gender pay gap
Board gender quota
Parental leave provisions
Cohort analysis
Institutional factors

ABSTRACT

This paper examines the role of information and regulatory interventions in mitigating the executive gender pay gap. We find female executives receive about 34% less compared to equivalent males from the same cohort, which falls by half over tenure within the company, but remains systematically significant throughout. The gender pay gap is the highest for young female executives and in the financial sector. Both demand-side (board gender quotas) and supply-side (family policies) regulatory interventions are associated with a lower gender gap in executive pay. Board gender quotas are associated with lower gender pay gap for experienced female executives in the highest age bracket. In contrast, supply-side interventions are associated with lower gender pay gap for the youngest female executives. Our results have important implications for the relative effectiveness of public policies that aim to reduce gender imbalance in corporate leadership and pay.

1. Introduction

Despite decades of progress in the labour market of female employees, the executive gender pay gap has been a common feature across several jurisdictions, including the U.S., the U.K., and Sweden (Carter et al., 2017; Gayle et al., 2012; Keloharju et al., 2019). Female executives earn substantially less than their male counterparts, a large proportion of which can be explained by female executives' relative lack of experience (Bertrand and Hallock, 2001). Besides, the gender gap in leadership positions is generally attributed to imperfect information about female productivity at the time of appointment (Cornell and Welch, 1996). However, it is unclear if employers update their information about the productivity of female executives over their tenure.

A range of public policies has been instituted to address the gender imbalance in corporate leadership. One set of policies, such as the board gender quotas, aims to address the gender gap by increasing the demand for female directors (Xu, 2018; Matsa and Miller, 2013). Another set of policies, such as shared parental leave provisions, and publicly-funded childcare arrangements, attempts to address the gender disadvantages related to the female labour supply choices (Ruhm, 1998). A commonly discussed source of gender disadvantage relates to family formation decisions, that could result in lower-income and missed promotion opportunities for female employees (Bertrand et al., 2010; Azmat and Ferrer, 2017; Blau and Kahn, 2000).

Against this backdrop, the objectives of this paper are two-fold. First, we investigate the information-bias in the executive gender pay gap and the updating of information by the employer over the executives' tenures. We implement a *within*-company analysis by tracking a cohort of executive directors from their first appointment on the board to examine the gender pay gap over their tenure. The

* Corresponding author.
E-mail address: Shibashish.Mukherjee@rug.nl (S. Mukherjee).

https://doi.org/10.1016/j.jcorpfin.2020.101857
Received 16 September 2019; Received in revised form 14 December 2020; Accepted 17 December 2020
Available online 13 January 2021

premise of this method is that the gender gap in the executive labour market can stem from traditionally male-dominated corporate boards finding it easier to evaluate prospective executives who are similar to themselves (Cornell and Welch, 1996). Female executives tend to have lower access to the male-dominated informal network, which exacerbates the information bias (Janiak, 2002; Fairfax, 2006). It can lead to male-dominated boards to stereotype women as being less competent at board work (Ferreira et al., 2017; Bordalo et al., 2016). The information bias will imply a high gender pay gap at the start of a cohort's tenure. The information-bias is likely to reduce once the productivity of female executives is revealed to the employer, leading to a reduction in the pay gap with respect to male executives within the cohort (Altonji and Pierret, 2001). By adopting a cohort-wise analysis, we compare the pay of male and female executives who started their tenure as executive directors in the same company in the same year. This approach allows us to examine if employer-learning about the productivity of female executives is reflected in the falling gender pay gap with tenure within the company. However, if employer learning is imperfect, a systematic component of the gender pay gap will persist throughout the tenure of the female executives.

A structural gender gap in executive pay forms a theoretical basis for regulatory interventions aimed at mitigating gender pay disadvantages (Altonji and Pierret, 2001; Olivetti and Petrongolo, 2017). In a recent study, Bertrand et al. (2019) show that following the Norwegian board gender quota, the gender pay gap within the board fell substantially. The fall in the gender pay gap is attributed to the selection of more qualified women to executive positions (Matsa and Miller, 2011). Companies affected by the quota compliance requirements invest in better search technology and appoint more qualified female executives (Ferreira et al., 2017). Therefore, our second objective is to examine if regulatory interventions could mitigate any systematic component of the executive gender pay gap. We compare the executive gender pay gap in countries with and without board gender quotas (demand-side policies). We also use a difference-in-difference approach to examine the variations in the executive gender pay gaps around the change in gender quota policies.

Next, we examine if parental leave provisions (supply-side policies)[1] are associated with the lower executive gender pay gap. Chhaochharia et al. (2019) show that mothers in lower childcare countries earn 25% lower than mothers in high childcare countries, and higher educated women benefit more from better childcare. If the early-career labour market disadvantage for female employees is related to family-formation decisions, shared parental leave provisions can loosen the household time-allocation constraint for highly-skilled women. Lower labour supply constraint can help female employees pursue leadership roles by returning to work full-time work quicker (Keloharju et al., 2019; Olivetti and Petrongolo, 2017).[2] Maternity benefits place the career disadvantage on the mother only but shared parental leave benefits loosens maternal labour-supply constraints.[3] Shared parental leave policies are also associated with a higher uptake of childcare related leave by fathers, and shorter career-breaks for mothers (Lalive et al., 2013; van Belle, 2016).

We use data on over 15 thousand executives of listed companies from eighteen countries for the period 2002–2015. We follow each cohort of executives appointed within our sample period throughout their tenure within a company.[4] After controlling for the observed characteristics of individual directors at the point of appointment (education, experience and position within the board), female executive directors receive 34% less than their male counterparts. There is a significant variation in the pay gap across industries (Adams and Kirchmaier, 2016). The executive gender pay gap is the highest for the companies in the banking and finance industry (57%), and lowest for consumer goods companies (11%).

Our first main result is that the executive gender pay gap falls with tenure within the company: half of the initial pay gap is bridged over six years of tenure as an executive. The effect of tenure on the pay gap is stronger for externally appointed female executives. These results are consistent with the employer learning hypothesis – the initial information bias is reduced over the tenure within the company leading to a lower gender pay gap. However, even for female executives in the highest quartile of tenure within the company, a residual gender pay gap persists. Although we cannot observe the mechanisms behind the initial pay gap at the point of executive appointments, using a cohort analysis allows us to provide evidence on the persistence of the gender pay gap, and the partial dissipation through employer learning.

Further, we show that the gender pay gap is highest for the executives in younger age groups (below the age of 54 years). This result is consistent with Bertrand et al.'s (2010) findings that female labour market decisions vary with age due to the changing nature of childcare responsibilities. In a study on Swedish executives, Keloharju et al. (2019) report that the gender gap in executive appointments arises in the first five years following the birth of the first child.[5] Since we do not have administrative data about the timing of maternity decisions in our multi-country sample, we use age as a proxy for effort- and labour-supply choices. Highly educated women are likely to delay the family-formation decisions, which implies that the youngest age group of directors (less than 47 years of age) in our sample are towards the end of the average reproductive cycle (Miller, 2011).

Our second main result relates to comparing the effects of gender quotas on corporate boards and provisions for family policies on

[1] We define parental leave provisions as childcare leave entitlement that can be shared between the parents. In some countries, parental leave is divided into a shared part and a non-shared part specifically reserved for the fathers, called "daddy quotas." Our baseline analysis is based on parental leave entitlements.

[2] Lalive et al. (2013) show that the presence of parental leave provisions reduces post-natal career disadvantage for mothers. There is some evidence that the parental leave policies are related to better uptake of childcare-related leave by fathers (van Belle, 2016).

[3] Family policies also vary across other parameters like subsidized childcare, part-time or flexible working arrangements. The variations across countries are more comparable for parental leave policies. Therefore, we restrict our study to these forms of supply-side interventions only.

[4] Given cohorts are constructed at the level of the company, it absorbs the unobservable differences in gender norms across companies.

[5] The gender pay gap that results from the career break persists, but there is no evidence that the maternity discount permanently impedes women's career growth.

the executive gender pay gap. We show that the executive gender pay gap is lower in countries with board gender quotas. Additionally, using a difference-in-difference setup, we show that the executive gender pay gap falls following the introduction of board gender quotas. The fall in the gender pay gap following board gender quotas is consistent with the long-term effects of the Norwegian board gender quota (Bertrand et al., 2019). Further, we find that countries with parental leave provisions have lower executive gender pay gaps compared to countries that do not have this provision. A difference-in-difference set up is not feasible with the supply-side policies because the majority of countries in our sample introduced parental leave policies before our sample period.[6]

We also show that the demand-side and supply-side policies affect different subgroups of female executives. The gender pay gap is the least – indeed positive – for the older sub-group of female executives in countries with board gender quotas. In contrast, in countries with parental leaves benefits, the total pay disadvantage for the youngest age group of female executives are qualitatively similar to that of the equivalent males. Companies react to gender quotas by appointing the senior female executives with more experience (Eckbo et al., 2019). On the other hand, we show that the supply-side policies reduce labour market frictions for younger women which enable them to overcome the maternity discount in pay. Together, the critical insight from our analysis is that the effectiveness of demand-side and supply-side interventions should be evaluated in light of their effect on the most disadvantaged group of female executives.

We contribute to several strands of the literature. First, we add to the literature on the gender pay gap for high-skilled workers.[7] A large proportion of the literature on executive pay treats the gender pay gap as a static phenomenon. We expand the scope of this literature by introducing the role of employer learning in dissipating the gender pay gap with tenure. The role of employer learning in reducing information bias has been previously studied with relation to the general labour force. For example, Altonji and Pierret (2001) use the National Longitudinal Survey of Youth 1979 to show that employers statistically discriminate against younger workers. Over time, companies gain more information about productivity, and the initial bias is reduced. Similarly, Mansour (2012) and Light and McGee (2015) show that employer learning varies across skills and job-types. These studies do not examine employer learning in the context of the gender pay gap. We contribute to this gap in the literature by examining the dissipation of the executive gender pay gap with tenure. Our results indicate that the role of employer-learning as a mitigating factor, and in the very least, any bias in the executive labour market may not be a binding one. However, our results suggest that employer learning does not entirely bridge the gender pay gap, and a structural component of the gender pay gap persists. In light of these results, the gender pay gap for executives should be seen as a dynamic learning process.

Second, our paper is related to the literature on gender policies. The extant literature on board gender quotas primarily evaluates the effectiveness of these gender policies through the lens of company performance. For example, Ahern and Dittmar (2012) and Matsa and Miller (2013) examine the market reaction to the announcement of the board gender quota, and the effect on the financial performance of Norwegian companies. While the focus on company performance is vital, the success of gender policies can manifest in terms of other measurable outcomes. In a study closely related to our's, Bertrand et al. (2019) examine the downstream effects of the Norwegian board gender quota on female labour market outcomes. Using a multi-country sample of companies, we show that the executive gender pay gap is lower in countries with board gender quotas.[8] Our results add to the discussion on the spillover effects of gender representation targets on corporate boards.

Next, we contribute to the effect of family policies on the gender pay gap, specifically for highly-skilled workers. Olivetti and Petrongolo (2017) provide an overview of the literature on the effect on female labour market outcomes of family policies. They find that highly-skilled female workers are particularly disadvantaged by long maternity breaks. In contrast, subsidized childcare increases maternal labour supply (Gelbach, 2002; Cascio, 2009; Lefebvre and Merrigan, 2008). Using a cross-country sample, Cipollone et al., 2014) show that family-oriented policies are associated with a 30% increase in labour market participation of highly educated females. Our contribution to this literature is that we show the effect of family policies on labour market outcomes for female executives in the top echelons of the corporate sector.

Finally, we provide new evidence on the differential effect of demand-side and supply-side policies on different sub-groups of female executives. Our results imply that public policies aimed at lowering the gender imbalance in corporate leadership positions should be evaluated in the context of the sub-group – in our setting the youngest female executives – who are the most disadvantaged. These results have implications for the debate on the effectiveness of board gender quotas as the primary mechanism to address the gender imbalance at the corporate workplace structurally.

[6] For example, Sweden introduced parental leave in 1974, Canada in 1966, and Germany in 1986.

[7] There is conflicting evidence on the gender gap in CEO pay in the U.S. (Bugeja et al., 2012). Whilst Hill et al. (2015) report significant pay premium for female CEOs, using updated data and better controls for confounding factors, Gupta et al. (2018) find no gender pay gap.

[8] In additional results, we also show that the fall in the gender pay gap is not related to post-quota depression of pay for male executives. We also show spillover effects in terms of committee appointments.

2. Data and empirical strategy

2.1. Sample selection

For this study, we focus on executive directors.[9] The reason is that not all companies routinely report compensation details for executives who are not on the board. However, disclosure of compensation data for the board of directors is mandatory in almost all major economies, and the quality of the disclosure is relatively comparable.

The data on board composition and executive compensation comes from BoardEx, which provides comprehensive global coverage of the directors-level data for listed companies which includes detailed information on the director's role within the company, tenure, outside affiliations, experience within committees, and compensation. BoardEx is a commonly used source of international executive compensation data (Fernandes et al., 2012; Ferri and Maber, 2013; Ozkan et al., 2012). We use the data on publicly listed companies from eighteen countries for the period 2002–2015.[10] We keep countries that have a minimum of 100 executive-director observations from listed companies.[11] The coverage of the compensation data in BoardEx varies by countries within our sample. On average about 11% of companies covered by BoardEx do not have complete data on all components of total pay (for example, LTIPs, Pensions, etc.), and 2.7% of companies have missing information on total pay, salary and equity-based compensation. These companies are unlikely to be a non-random sub-sample, but given the small fraction, we exclude them from the sample. We augment our sample with accounting and market data collected from the Worldscope database. We exclude observations with missing financial data from the sample.

Further, we hand-collect country-level data on the gender norms from the reports published by the United Nations Development Program. We capture the effect of country-level gender norms by using the Gender Inequality Index (GII). The index measures the disadvantages facing women and girls as a source of inequality. It ranges from 0, indicating that women and men fare equally, to 1, showing that women fare very poorly in all measured dimensions. GII includes different dimensions from those of the related Human Development Index, namely, health, empowerment, and the labour market.[12] We computed the deciles of the GII scores for all countries. This data are available for five-year intervals between 1995 and 2010, and annually afterwards. We use indicators for the decile of GII of the country at the beginning of our sample period in our empirical models.[13]

We also hand-collect information on the presence of board gender policies and family policies from the World Bank report on *Women Business and the Law* (World Bank, 2015). It provides detailed data on seven indicators that affect women's economic opportunities across the world. We focus on the data on paternity and shared parental leave provisions (Kluve and Tamm, 2013; Kluve and Schmitz, 2014; Cools et al., 2015). Shared parental leave policies are essential in our case because they influence the choices women face during their career trajectory and the opportunities available to them. Lack of adequate maternity provisions can discourage women from pursuing a leadership track from a very early stage. On the other hand, too long a leave may undermine women's labour force participation if it discourages employers from hiring or promoting women of childbearing age. While paid maternity leave, with variation in the duration, is standard in almost all large economies, countries vary widely in the provisions for parental and paternal leave entitlements.[14]

Parental benefits which enable mothers, fathers or both to take paid time off to care for a newborn child can lead to a more equitable intra-household division of childrearing responsibilities. Such distribution of household chores can, in turn, mean more significant opportunities for career advancement of the mother. Only 53 out of 173 countries in the world and 8 out of 15 countries in our sample have paid parental leave provisions.[15] Paid parental leave gives more flexibility to both parents in pursuing their careers, but this is especially relevant for mothers, whose return to the workforce after maternity depends on their ability to share childcare responsibilities.[16] Using this information, we construct a binary indicator for the presence of paid parental leave. Also, we construct measures of paternal leave provisions as an alternate measure of flexible childcare arrangements. However, since our focus is not on welfare implications, we do not differentiate between the funding mechanisms of these provisions (public vs employer funding).

We create a binary indicator for countries with a gender quota on the corporate board. The indicator variable takes the value of 1 in all countries with a board gender quota, starting the year in which the law was passed.[17] In our sample, 9 out of the 18 countries have

[9] Non-executive directors form an attractive group to focus on in the context of the gender pay gap. We have focused on the executive directors for two reasons. One, while there are quite a few studies on the gender gap in non-executive pay, there is scant evidence on the same for female executives. The second issue is with estimating the effect of employer learning on non-executive directors' pay. Since the non-executives tend to have more than one concurrent appointments, the employer learning models need to account for (potential) multi-lateral learning by each employer about the different positions of the non-executives. Future research can explore this issue within a multi-lateral learning model.

[10] The BoardEx sample coverage started in 1999, but data coverage is inadequate in the first few years. We construct our sample from BoardEx database published in March 2017. For this version of the data, the coverage of 2016 was incomplete. Therefore, our sample period stopped in 2015.

[11] To address the concerns that countries with a smaller number of observations may disproportionately affect our results, we check for the robustness of our results by grouping countries on various parameters.

[12] For more information about the index, see http://hdr.undp.org/en/content/gender-inequality-index-gii

[13] For the beginning of our sample, we use GII information from 2000.

[14] Some employers may offer childcare benefits to employees. However, we do not have systematic company-level data from all countries on employer-provided childcare benefits.

[15] The U.S. does not have provisions for guaranteed maternal, paternal or parental leaves, and is coded accordingly.

[16] A plausible alternative to paid parental leave provisions is subsidized childcare costs. In our international sample, countries with some form of paid parental leave also have subsidized childcare. The exceptions to this are India and Indonesia.

[17] We examine the robustness of our results by constructing the binary indicator differently. We discuss this in Section 3.4.

instituted a board gender quota policy. Norway is the first country to pass such a law in 2003, while Germany is the latest country to pass a law mandating a board gender representation target in 2015. There are considerable differences in the implementation of board gender quota policies across countries: such as the mandated proportion of female directors, the time to compliance, etc. We do not focus on these differences in our analysis.

Finally, we control for the standard company-, board- and director level factors that might affect the pay gap. We control for the number of directors on the board, and the board independence. Our measure of the financial performance of companies is ROA and Tobin's Q, and we use the log of total assets as a measure of company size. For individual directors, we control for their education and work experience (such as the number of qualifications), and executive positions (such as board chair, CEO and CFO). We describe the construction of all the variables used in this study in appendix A.

2.2. Summary statistics

Our sample consists of over 66 thousand executive-year observations.[18] Approximately 5% of the directors are female executives. The proportion of female executives vary widely across countries: 26% of Norwegian executives are female, whereas, in Italy, women occupy only 1.5% of the executive seats. In the emerging economies, the proportion of female executives exceed 10% only in China (10%) and South Africa (14%). We present the country-wise breakdown of the percentage of female executives and the unconditional gender pay gap in Table 1 and Fig. 1. At the company-level, 58% of the sample companies have at least one female executive on board.[19]

Our two main compensation variables are Total Pay and Equity. In Total Pay, we include Cash Annual with Pension and Deferred Compensations (TCAPDC) or Cash and Equity. Equity is the proportion of equity-linked pay per Total Pay. When calculating the pay, we only take into account the pay from the company where an individual has an executive appointment and disregard any compensation received from non-executive appointments. From Table 1, we note that the average Total Pay of executive directors is $387 thousand.[20] Female directors, on average, are paid US$ 269 thousand compared to US$ 402 thousand for male directors. It translates into 66 cents on the dollar in total pay or an unconditional executive gender pay gap of 33%.[21]

There is considerable cross-country variation in the executive gender pay gap. For example, the unconditional pay gap in the full sample is substantial is most countries: France (−72%), the U.S. (−66%) and Canada (−82%) have the highest gender pay gaps among the developed economies while Australia (+ 14%, but not statistically significant at conventional levels), Denmark (+ 1.7%), Italy (−9%) and the United Kingdom (0%) has the smallest unconditional executive gender pay gaps. In the emerging economies, the widest pay gaps are in Hong Kong (−77%) and Malaysia (−85%). In comparison, the gender pay gap for Chinese executives (+ 50%) is not statistically significant at conventional levels.[22] Prima facie, the unconditional pay gap does not seem to depend on the legal structure. Among the common law countries, the U.S. has a high executive gender pay gap, while the gender pay gap for U.K. executives is among the lowest in the world. The executive gender pay gap in the U.K. has historically been lower than the global average leading up to gender parity in executive pay around 2011. Since then, the gender pay gap has widened but remains well below the global average.[23]

The unconditional pay gap must be placed in the context of the gender differences in the education and experience of executives. We present the differences in observable director characteristics by gender. Male and female directors seem to be well-matched on observable characteristics: there is no statistically significant gender difference in educational qualifications. We construct both de-facto and *de-jure* measures of experience. First, we build a measure for the tenure of the directors. On average, male directors have two years longer tenure than female directors. We also construct measures for outside experience as non-executive directors, and experience of being Chairpersons of the audit, nomination and remuneration committees in other companies. Male executives have more experience in these roles than female executives. A full summary of the sample is presented in Table 2.[24]

There is wide variation across countries in the adoption of gender policies. In part, these policies may reflect historical, cultural norms on gender issues in these countries. We broadly classify these interventions as demand-side (board gender quotas) and supply-side (family policies). The aims and transmission mechanisms of these initiatives are hard to compare, as is the role of culture. However, we focus on the cross-sectional variations in the gender pay gap for countries with and without such policies.

The countries with a board gender quota in our sample are France, Germany, Israel, Italy, Malaysia, Netherlands, Norway, South Africa, and Spain. We create a binary indicator for the presence of a Board Gender Quota which equals 1 from the year of implementation of the quota till the end of our sample period.

[18] Non-executive directors also form an attractive group of employees to examine in the context of board gender quotas. However, these directors are often concurrently members of multiple boards, none of which is a full-time position, and have incomes from all these sources. These aspects of the non-executive positions are incompatible with the employer learning models.

[19] A substantial fraction of companies have female non-executive directors: 86% of the sample companies have at least one female non-executive director on the board.

[20] The compensation data is reported in $US, nominal. We do that because the focus of our paper is not in the international comparison of the levels of pay, but within-country gender pay gaps.

[21] We use the standard formula to calculate the executive gender pay gap $= 1 - \frac{Female\ Pay}{Male\ Pay}$.

[22] The other countries with a lower executive gender pay gap than the global average are the Netherlands, Sweden, Denmark, France and Norway.

[23] Although no causal interpretation can be drawn, in 2011, the Davies Commission in the U.K. set a voluntary target of 25% representation of female directors on corporate boards.

[24] Gender differences are possible in other dimensions. For example, Adams and Ferreira (2009) document gender differences in attendance at board meetings. We do not have reliable data on board attendance from all countries.

Table 1
Executive gender pay gap by countries.

	Exec. Dir. (Total)	Exec. Dir. (% Board)	Female Exec. Dir. (% Board)	Executive compensation		Male executive compensation		Female executive compensation		Gender gap		Board gender quota year	Parental leave
				Cash	Cash and Equity	Cash	Cash and Equity	Cash	Cash and Equity	(Female – Male)	t-stat		
Australia	259	19.2	4.6	308.63	340.89	313.50	344.09	187.60	261.20	−82.89	0.39		Yes
Canada	193	12.8	2.5	484.21	859.89	496.59	884.55	98.50	91.33	−793.22	−3.01***		Yes
China	115	17.1	11.4	97.79	527.47	95.48	558.23	117.67	263.42	22.19	0.72		No
Denmark	135	5.9	4.8	502.66	506.78	531.67	532.91	376.65	370.50	−161.17	−1.92*		Yes
France	3225	7.2	3.6	777.51	1443.99	839.87	1562.99	155.73	257.72	−1305.27	−9.73***	2011	Yes
Germany	5739	4.6	2.3	1005.23	1292.11	1055.25	1365.95	457.48	483.11	−883.21	−9.82***	2015	Yes
Hong Kong	145	16.8	9.0	235.03	280.11	249.94	301.72	83.62	60.62	−241.10	−3.46***		No
Ireland	1701	11.7	3.2	763.92	1951.04	771.86	1973.32	511.91	1244.49	−728.83	−2.23***		Yes
Israel	196	15.4	6.1	196.10	248.39	203.23	256.61	86.67	122.41	−134.20	−1.98**	2007	Yes
Italy	527	7.0	1.2	897.85	1247.24	908.13	1262.94	230.31	228.89	−1034.05	−5.18***	2011	Yes
Netherlands	814	9.5	1.8	982.88	1623.32	986.55	1624.77	800.04	1550.93	−73.84	−0.72	2013	No
Norway	320	13.0	5.9	77.74	111.15	93.54	141.00	34.78	29.90	−111.11	−2.58***	2003	Yes
South Africa	102	14.1	13.6	497.81	699.15	543.84	780.44	230.87	227.67	−552.77	−2.56***	2014	No
Spain	568	7.1	5.2	1140.89	1703.23	1093.29	1642.29	2219.84	3084.45	1442.16	3.32***	2007	Yes
Sweden	465	12.5	7.6	151.37	153.49	159.07	161.38	56.71	70.51	−90.87	−3.34***		Yes
Switzerland	417	9.6	6.3	1570.88	3404.39	1588.21	3485.46	1072.00	1070.68	−2414.78	−4.4***		No
The U.K.	35,357	15.2	10.8	640.82	1120.34	643.44	1123.47	581.90	1049.96	−73.51	−2.09**		Yes
The U.S.	16,212	9.7	8.4	1099.007	5962.067	1117.97	6042.45	681.3855	4191.29	−1851.16	−12.98***		No
Full Sample	66,426	12.3	5.4	641.47	1277.26	658.09	1312.08	424.16	749.64	−562.44	−9.29***		

In this table, we present the unconditional gender pay gaps in our sample countries, along with the proportion of female executives and the year of adopting board gender quota policies and the presence of parental leave policies.

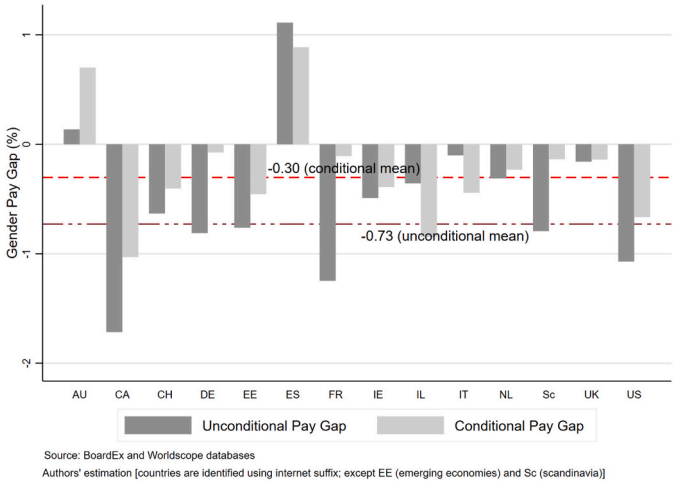

Fig. 1. Executive Gender Pay Gap Worldwide (2000–2015).
In this figure, we present the gender pay gap in executive director compensation for our sample of international companies. We present both the unconditional pay gap and the pay gap, conditional on the observable director and company characteristics like education, experience, tenure, non-executive positions, size and profitability of the appointing company.

Table 2
Summary statistics.

Variables	N	Mean	Std. Dev.	Min	Max
Pay Variables					
Female Executive	66,426	0.05	0.22	0	1
Cash ('000 US$)	66,422	801.32	952.47	0	3916.12
Cash and Equity ('000 US$)	66,426	2360.92	4187.29	6.18	17,727.00
Female Executive: Cash ('000 US$)	3305	531.78	793.16	0	3916.12
Female Executive: Cash and Equity ('000 US$)	3305	1526.52	3535.67	6.18	17,727.00
Dummy: Equity Compensation	66,426	0.55	0.50	0	1
Board and Individual Characteristics					
Board Size	66,426	11	5.6	1	34
Board Independence	66,426	0.48	0.24	0	1
Dummy: CEO	66,426	0.29	0.45	0	1
Dummy: CFO	66,426	0.057	0.23	0	1
Dummy: Board Chair	66,426	0.23	0.42	0	1
Dummy: Executive Committee Member	66,426	0.22	0.41	0	1
Dummy: External Appointment	66,426	0.45	0.50	0	1
Tenure	66,426	7.03	7.19	0.10	34
Outside Non-Executive Positions	66,426	1.70	1.38	1	24
Age	66,426	54	9	23	92
Number of Qualifications	66,426	2	1	1	11
Company Characteristics					
Total Assets ($US; Millions)	66,426	43.59	148.19	0.00	1047.06
Operating ROA	66,426	0.04	0.14	−0.62	0.33
Tobin's Q	66,426	0.94	1.14	0.02	6.29

In this table, we present the summary statistics for our full sample. The sample consists of 66,426 observations. The monetary values are winsorised at 1%.

Similarly, we create an indicator for countries with parental leave provisions. The countries with parental leave provisions in our sample are Australia, Canada, Denmark, France, Germany, Ireland, Israel, Italy, Norway, Spain, Sweden and the U.K. Parental leave provisions were instituted in most of these countries before the start of our sample period. Therefore, the indicator is 1 for all years in countries with parental leave entitlements. For robustness, we focus on two aspects of childcare policies. First, we examine the funding mechanism for childcare, i.e. if the parental leave is, at least partially, funded by the government.[25] We also control for the length of the parental leave entitlements: it is highest in Germany (360 days) and lowest in Singapore (7 days).[26]

[25] Almost all countries in our sample have mandated maternity leave provisions, with the notable exception of the U.S.
[26] Details of firm-level parental leave policies and entitlements are not systematically available for most countries.

2.3. Empirical strategy

Our empirical strategy comprises of two parts. In the first part, we focus on examining if the gender pay gap falls over the tenure of the executives and if we can attribute this narrowing of the gender pay gap to employer learning. Our approach is to compare male and female executives from the same cohorts over the years of tenure in the same company. A cohort is comprised of all executives who get their first executive appointment at the same company in the same year. It implies that our identification strategy depends on identifying cohorts of two or more executive hires where the new hires include both male and female executives. Recent papers examining gender effects in corporate leadership takes a similar approach of comparing cohorts, where at least one male and one female director are appointed in the same year (Giannetti and Wang, 2020). For each cohort, we examine the gender pay gap at the end of each year on the board. To ensure that the male and the female executives are similar in attributes, we control for the education, experience, and rank within the board (CEO, CFO, and Board Chair) at the beginning of the tenure of each executive. We estimate the following benchmark model.

$$Pay_{it} = \alpha + \beta Female\ Executive_i + \gamma X_{it} + C_t + v \quad (1)$$

here β captures the gender pay gap; X_{it} is a vector of individual, company and country characteristics, C_t controls for the cohort fixed effects, and v is the error term.

Further, to examine employer learning leads to lowering of the gender pay over tenure, we add an interaction of *Female Executive* and *Tenure* in a specification with individual director fixed effects (f_i). Here too, v is the error term:

$$Pay_{it} = \alpha + \beta Female\ Executive_i + \delta Female\ Executive_i{*}Tenure_{it} + \gamma X_{it} + f_i + v \quad (2)$$

The estimate of the δ will capture the change in pay with tenure with female executives compared to similar men. If the δ is positive, it will mean that the pay of female executives improves with tenure, and the average effect will be the net of the δ and the β. We also estimate a non-parametric form with tenure groups based on the quartiles from the distribution of tenure of the female executives. We create four tenure groups: less than two years (*Tenure Group 1*), 3–5 years (*Tenure Group 2*), 6–8 years (*Tenure Group 3*) and more than nine years (*Tenure Group 4*).

As a descriptive exercise, we plot the gender pay gap for each additional year of tenure within the company. In Fig. 2, we show that the cohort-wise gender pay gap falls with tenure within the firm. By the sixth year of tenure, the gender pay gap is 8%, down from 21% at the start. However, as we show in Table 3, the gender pay gap remains significant throughout the tenure of the cohorts within the company. The difference in the average gender pay gap between the highest and the lowest Tenure groups is statistically significant at the 5% level.

In the second part of the analysis, we focus on estimating the association of regulatory interventions in reducing the gender pay gap. The regulatory interventions, either board gender quotas or parental leave policies, are often related to the gender norms of the country that institutes them. In our models, we control for the gender inequality index (GII) for the country where a company is publicly listed. The two variables of interest are Quota (= 1 for countries with a board gender quota) and Parental Leave (= 1 for countries with shared parental leave policies). We estimate the following model.

$$Pay_{it} = \alpha + \beta Female\ Executive_i + \theta Policy_{kt} + \gamma X_{it} + C_t + v \quad (3)$$

here θ captures the effect of the gender policy (Quota or Parental Leave) in country k on executive pay. X_{it} is a vector of GII and other company-level covariates, and we include cohort dummies C_t. We cluster the standard errors at the director-level.[27]

To examine if the policies have different effects on the sub-groups of executives, we sort executives in categories depending on the age at the beginning of their tenure. From the distribution of age of the female executives, we construct age groups based on the quartiles. We adopt a similar non-parametric strategy as that in model 2 for examining heterogeneous treatment effect. We use the triple interaction of Female, Policy and Age Quartiles to examine the effect of policies on female executives in different age groups.[28]

We do not explicitly set out to provide causal evidence on the effects of institutional interventions on the executive gender pay gap. Any empirical study on establishing causal mechanisms for the gender pay gap is fraught with endogenous choices in board formation, labour supply choices and institutional legacies. However, we make attempts to address some of the obvious endogenous biases in our empirical design. First, we control for the executive cohort, i.e. the year of the first appointment in the board in addition to education and experience to control for unobservable differences in executive ability. In this setting, we cannot comment about the first selection of the executives on board, but we take steps to account for the unobserved heterogeneities. Second, the cohort analysis within the company helps us mitigate confounding effects of director mobility and employment choices.

Further, we seek to mitigate the concern that board gender quotas and the gender pay gap may be co-determined by gender norms rooted in the national culture. We estimate a difference-in-difference specification to examine the variation in the executive gender pay gap around the change in board gender quota policies. A similar exercise is not feasible for the family policies because the institution of family policies in a large majority of countries predates our sample period.

Finally, we control for industry classifications in our baseline models and test the robustness of our results to subsamples of

[27] Bootstrapping the standard errors in all our models do not alter our results.

[28] In alternate specifications, we partition the sample by Quotas and Parental Leave policies and use interactions of Female Executive dummy and the Age Groups.

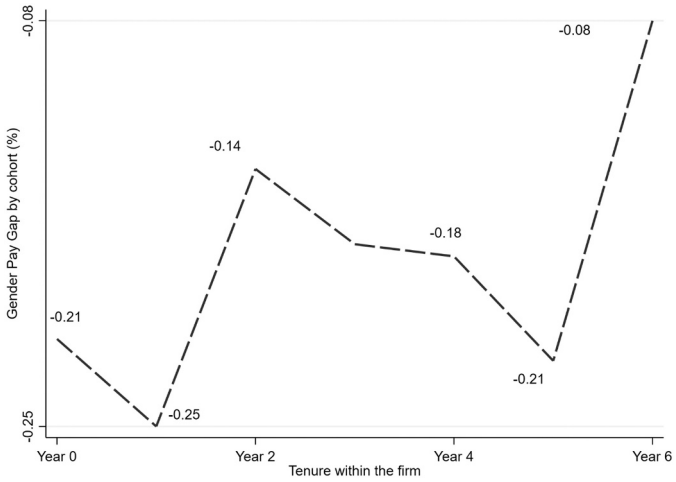

Fig. 2. Executive gender pay gap over tenure.
This figure presents the evolution of the gender pay gap for executive directors in the same cohort over the tenure in the company. Here, 0 on the y-axis represents no gender pay gap.

industries. In our cross-country sample, international mobility of executives is relatively rare to induce assortative sorting bias in our results. Nevertheless, to account for that possibility and yearly variations, we include country and year dummies to control for differences at the country level.[29] We also check the robustness of our results across the distribution of company size, and for subsamples of companies in the financial sector (lowest proportion of female executives) and the consumer goods industry (the highest proportion of female executives).

3. Results

3.1. Executive gender pay gap and employer learning

We begin by providing preliminary evidence on the executive gender pay gap. The basic premise is to examine the extent to which the gender pay gap for executives, a part of the labour market where male and female employees are well-matched in observable characteristics, be explained by gender differences in experience, risk-aversion and effort choice. We present the results in Table 4. First, we examine the unconditional pay gap for male and female executives, which is estimated to be approximately 63% and is statistically significant at conventional levels. Progressively we condition the gender pay gap on a range of observable factors in column 2. We control for age, education, and a full set of company-level controls that is standard in the literature: board size, company size, financial performance.

One concern with estimating the gender pay gap for executive directors is the confounding effect of pay differences across different roles within the board. For example, the CEO is commonly the highest-paid executive within the board, and they are disproportionately male. We include dummies for CEO, CFO, and the Board Chair.[30] In our sample, only 2.6% of the CEOs, 6.9% of CFOs and 1.4% of Board Chair are female. We use dummies for these executive positions in column 3 of Table 4. Additionally, we use a dummy that equals 1 if an executive if the member of audit, nomination or compensation committees. Only 1.1% of the members of these three committees are female. The executive gender pay gap persists after controlling for these positions.

A possible reason for the gender pay gap is that the labour-supply choices of male and female directors can be different. Female directors may voluntarily choose positions with lower responsibility that is optimal with their childcare obligations. Since we cannot perfectly observe labour supply choices, we use age and age-squared as a control. Our results show that age and age-squared are both statistically significant, and have the opposite signs. We also control for outside appointments as non-executive appointments as another measure of effort supply decisions. The underlying assumption is that executives who take up outside appointments as non-executive directors might have lower time-constraints to be able to do so. Finally, we control for the cohort and industry level variations. With these controls, the gender pay gap falls by about 50% - female executives are paid 34% lower in specification 3.

In column 4, we use an interaction term of *Female Executive x Tenure*. We include measures of education and experience of

[29] One concern is that the effects we observe for regulatory interventions reflect the effect of changing social norms. We examine this possibility in the later sections.

[30] CEO, Board Chair, and CFO are the three executive positions present in all the boards in our sample. Board Chair and CEOs constitute the two largest groups of executives within our main sample at 23 and 29%, respectively. To ensure our baseline results are not driven by a single subsample of executives, in appendix 4, we estimate the gender pay gap for the most common executive positions within the board: Chairperson, Chief Executive Officer (CEO), and Chief Financial Officer (CFO).

Table 3
Gender pay gap over the tenure and the age distribution.

		Total Executive Director Obs.	Female Executives (per cent)	Ln (Unconditional Pay Gap) (Women - Men)	t-stat
Panel A: Executive Director Cohorts within the Company					
Tenure Group 1	Year 0	3,521	8.8	-0.81	-7.96***
	Year 1	3,082	8.4	-0.73	-7.23***
	Year 2	2,405	8.4	-0.72	-6.63***
Tenure Group 2	Year 3	1,881	8.3	-0.70	-6.89***
	Year 4	1,487	7.6	-0.68	-4.96***
	Year 5	1,156	7.1	-0.97	-5.49***
Tenure Group 3	Year 6	901	6.7	-0.87	-4.08***
	Year 7	681	7.0	-0.89	-3.66***
	Year 8	678	7.1	-0.85	-3.48***
Tenure Group 4	Year 9+	514	6.4	-0.99	-3.42***
Panel B: Age Quartiles					
Age Group1	Age < 47	14,623	0.081	-0.85	-14.30***
Age Group2	48< Age <54	18,507	0.056	-0.78	-15.69***
Age Group 3	55< Age <60	16,001	0.041	-0.63	-10.42***
Age Group 4	Age > 60	17,295	0.023	-0.89	-8.96***

This table presents the evolution of the gender pay gap over the tenure of executives and the age distribution. In panel A, we present the unconditional gender pay gap over the tenure of the executives in the company. In panel B, we present the results for the gender pay gap for the quartiles of age, drawn from the distribution of age for female executive directors. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

executives at the start of the tenure, which allows us to compare the pay of individual female employees over the tenure compared to male executives who have similar attributes. We report the results in column 4 of Table 4. The coefficient on the interaction term is positive and statistically significant, while the coefficient on the *Female* indicator remains negative. The net effect of *Female Executive* and *Female Executive x Tenure* is −10.3%, significantly lower than the estimates in columns 1 to 3.[31] These results are consistent with the employer learning hypothesis: female executives start their tenure at a pay disadvantage which falls over time; however, a significant component of the pay gap is never fully bridged.[32]

Finally, column 5 shows that female director on average has a lower fraction of equity-based pay: the gender gap is equity compensation is approximately 24% and is statistically significant at the 1% level.[33] The interaction *Female Executive x Tenure* is not statistically significant even though the direction of the coefficient is positive. Therefore, we cannot infer any decline in equity-based pay gap with an increase in tenure.

3.1.1. External vs internal appointments

The basic premise of the employer learning hypothesis is that employers update their prior views from the information revealed

[31] In an alternate specification, we estimate our baseline models with firm dummies to control for unobserved firm-specific factors that might affect the gender pay gap. Our results are qualitatively similar to the baseline estimates. We present the results in the internet appendix 1.
[32] About 41% of the sample firms have a female director on the nomination committee. We find no statistically significant effect of female executives in the nomination committee on the female executives' pay. We present the results in the internet appendix 2.
[33] Lower equity compensation is related to the lower total compensation due to lower risk in the compensation structure. In this paper, we only note the differences across gender without examining the underlying reasons.

Table 4
Gender gap in executive pay.

	Ln (Total Pay)				Equity (% of Total Pay)
	(1)	(2)	(3)	(4)	(5)
Female Executive	−0.628***	−0.442***	−0.345***	−0.208***	−0.240***
	(0.206)	(0.134)	(0.102)	(0.061)	(0.082)
Female Executive x Tenure				0.105**	0.052
				(0.043)	(0.031)
Num. of Qualifications		0.042***	0.034***	0.003	0.000
		(0.013)	(0.011)	(0.002)	(0.000)
Age		44.364***	34.750***	12.175***	0.333
		(11.07)	(10.340)	(3.354)	(0.302)
Age^2		−5.845***	−4.602***	−2.108***	−0.049
		(1.203)	(1.113)	(0.670)	(0.043)
Tenure		0.140**	0.108***	0.154***	−0.035***
		(0.057)	(0.034)	(0.033)	(0.011)
Outside Non-Executive Positions		0.474**	0.068***	0.009**	0.036***
		(0.228)	(0.22)	(0.003)	(0.010)
Total Assets		0.348***	0.338***	0.203***	0.028***
		(0.107)	(0.110)	(0.037)	(0.009)
Tobin's Q		0.131**	0.129***	0.019	0.040***
		(0.060)	(0.035)	(0.011)	(0.013)
Board Size		0.048*	0.174**	0.118**	−0.055***
		(0.026)	(0.049)	(0.045)	(0.016)
Board Independence		0.261*	0.900**	−0.024	0.077***
		(0.135)	(0.320)	(0.016)	(0.022)
Board Chair			0.323***	0.188***	0.047***
			(0.101)	(0.025)	(0.015)
CEO			1.029***	0.567***	0.043***
			(0.393)	(0.041)	(0.011)
CFO			0.678***	0.205***	0.034***
			(0.234)	(0.060)	(0.009)
Committee Member			0.124***	0.137***	0.237***
			(0.030)	(0.038)	(0.063)
Cohort	Yes	Yes	Yes	Yes	Yes
Industry	No	Yes	Yes	Yes	Yes
Country	No	Yes	Yes	Yes	Yes
Obs.	66,426	66,426	66,426	66,426	36,465
R^2	0.133	0.583	0.618	0.643	0.398

This table presents the baseline results for the gender gap in the pay of executive directors. The dependent variable in columns 1–4 in the natural log of total pay. In column 5, the dependent variable is the proportion of equity-based pay. The main independent variable is the *Female Executive* dummy. In column 1, we present the unconditional gender gap in executive directors' pay. In column 2, we add company and board-level covariates, and in column 3, we add controls for executive positions. In column 4, we present the baseline results of employer learning with the interaction of *Female Executive* and *Tenure*. Robust standard errors, clustered at the company level, are in parentheses underneath the coefficients. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

about an employee's productivity during their tenure. More information is available to employers on the productivity of executive directors appointed from within the organisation compared to executive directors appointed externally. To examine the gender pay gap over the tenures of executives appointed externally vs internal appointments, we create an indicator *External Appointments* which we code as 1 if an individual has spent the number of years in the executive role is the same as the number of years in the company. Forty-four per cent of the executives in our sample are externally appointed.

We estimate the baseline models separately for internal and external executive appointments and report the results in Table 5. Both internally appointed and externally appointed female executives are paid lower compared to comparable male executives. The parameter estimate of *Female Executive* dummy is qualitatively similar for both internal and external appointments. Further, we find that the coefficient on the interactions of *Female Executive* and *Tenure* is economically small for internal appointments. For example, the net gender pay gap for female executives in the highest tenure group is 19.3% compared to the baseline estimate of the gender pay gap for internal appointments (23.1% in column 1). It appears that the information about the productivity of internally appointed executives is already "priced in" the baseline gender pay gap.

In contrast, for externally appointed executive directors, the gender disadvantage falls more significantly with tenure. The net gender pay gap for female executives in the highest tenure group is 1.9% compared to the baseline estimate of the gender pay gap for internal appointments (23.1% in column 1). These results are consistent with the employer learning explanation. Although the baseline gender pay gap is not statistically significantly different for internal and external appointments, new information about the externally appointed executive directors revealed to the employers leads to a more substantial decline of the gender pay gap over their tenure.

Table 5
Internal vs external appointments.

	Dependent variable: Ln (Total Pay)			
	Internal appointments		External appointments	
	(1)	(2)	(3)	(4)
Female Executive	−0.231***	−0.221***	−0.251***	−0.207***
	(0.055)	(0.057)	(0.047)	(0.059)
Female Executive X Tenure Group 2		0.098		0.012
		(0.063)		(0.060)
Female Executive X Tenure Group 3		0.033**		0.108***
		(0.012)		(0.035)
Female Executive X Tenure Group 4		0.028***		0.188**
		(0.008)		(0.055)
Tenure Group 2		0.133***		0.146***
		(0.015)		(0.017)
Tenure Group 3		0.136***		0.167***
				(0.027)
Tenure Group 4		0.121***		0.147***
		(0.029)		(0.049)
Other Controls and Constant	Yes	Yes	Yes	Yes
Cohort	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Obs.	38,544	38,544	27,555	27,555
R^2	0.601	0.618	0.636	0.654

This table presents the gender pay gaps for internal executive appointments (columns 1 and 2) and external executive appointments (columns 3 and 4) We define Tenure Groups, as shown in Table 3. All specifications include the full set of controls that includes board and individual characteristics, company characteristics, the industry and country dummies, and control for cohorts. Robust standard errors, clustered at the company level, are in the parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

3.1.2. Tenure and age effects

We examine the evolution of the gender pay gap through the cohort of the directors within the company using a non-parametric specification of tenure. To locate the point in tenure where the information bias against the female executives begins to dissipate, we use the tenure groups corresponding to the quartiles from the distribution of tenure of the female executives. In columns 1 and 2 of Table 6, we present the results using these groups where the executives in the youngest tenure group are the omitted group. Our focus is on the interaction effect of the female indicator and the indicators for the tenure quartiles. We find that the gender pay gap is highest in the youngest tenure group and decreases in the higher tenure quartiles.

Similar to tenure groups, we focus on the age effects in the gender pay gap for executives. One reason for the lack of female representation at the top of the corporate hierarchy is related to labour supply choices, most notably regarding family matters such as marriage and child-rearing. We expect that the labour supply decisions of female directors due to maternity will vary with age groups (Bertrand et al., 2010; Keloharju et al., 2019).

We create four groups using age at the time of the first executive appointment: less than 47 years (*Age Group 1*), 47–51 years (*Age Group 2*), 52–56 years (*Age Group 3*) and more than 57 years (*Age Group 4*). These age groups correspond to the quartiles from the distribution of age of the female executives. The results are presented in Table 6. In columns 3 and 4, we present the results using these groups where the female executives in the youngest age group in the omitted group. Our focus is on the interaction effect of the female indicator and the indicators for the age quartiles. We find that the gender pay gap is highest in the youngest age group and decreases in the age groups 3 and 4. Since we do not have detailed data on the fertility decisions of individuals, we cannot make any causal interpretations of these results. However, it is reasonable to assume that the fertility decisions will be disproportionately localised in the youngest age groups (Keloharju et al., 2019). Therefore, our results suggest that in the youngest age group, the gender pay gap is the highest due to the maternity-discount in female executives' pay. Over time, however, the female executives partially overcome the pay disadvantage compared to men in the same cohort.

3.2. Executive gender pay gap and regulatory interventions

Since a systematic component of executive gender pay gap persists even after employer learning, we turn our attention to the effectiveness of demand and supply-side gender policies. To that end, we use the cross-country variation in the presence of board gender quotas and parental leave provisions. First, we estimate the executive gender pay gap for matched groups of executives in countries with and without board gender quotas and shared parental leave policies. For this test, we use a stratified random sample with over-representation of males executives, appointing companies in certain industries, and executives from specific cohorts (i.e. the year of the first appointment). In our setting, executives are "treated" to board gender quotas and shared parental leave provisions.

To compare the gender pay gap for executives with similar characteristics other than gender, we match individuals on age, education, experience, position within the board, characteristics of the appointing company (sales, ROA, MTBV and the industry) and the cohort (year of the first appointment as an executive director). We use the nearest neighborhood, radius, and Mahalanobis distance matching methods. The results are presented in Table 7. In all the subsamples, the gender pay gap is negative and statistically

Table 6
Employer learning: age and tenure effects in gender pay gap.

	Dependent variable: Ln (Total Pay)			
	(1)	(2)	(3)	(4)
Female Executive	−0.288***	−0.293***	−0.352***	−0.231***
	(0.051)	(0.052)	(0.044)	(0.057)
Female Executive X Tenure Group 2		0.058		
		(0.052)		
Female Executive X Tenure Group 3		0.133**		
		(0.057)		
Female Executive X Tenure Group 4		0.178**		
		(0.060)		
Female Executive X Age Group 2				−0.099
				(0.074)
Female Executive X Age Group 3				0.211**
				(0.097)
Female Executive X Age Group 4				0.031**
				(0.014)
Age Group 2			0.017	0.026
			(0.019)	(0.019)
Age Group 3			0.054**	0.211**
			(0.023)	(0.097)
Age Group 4			0.603**	0.369**
			(0.301)	(0.149)
Tenure Group 2	0.117***	0.120***		
	(0.0143)	(0.014)		
Tenure Group 3	0.105***	0.114***		
	(0.021)	(0.021)		
Tenure Group 4	−0.040	0.378*		
	(0.033)	(0.197)		
Other Controls and Constant	Yes	Yes	Yes	Yes
Cohort	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Obs.	66,426	66,426	66,426	66,426
R^2	0.576	0.592	0.616	0.618

This table presents age (columns 1 and 2) and tenure effects (columns 3 and 4) in the gender gap in the pay of executive directors. We define Age groups and Tenure Groups, as in Table 3. The omitted categories are Age Group 1 (< 47 years of age) and Tenure Group 1 (< 2 years of tenure). All specifications include the full set of controls. They include board and individual characteristics, company characteristics, the industry and country dummies, and control for cohorts. Robust standard errors, clustered at the company level, are in the parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7
Executive gender pay gaps in matched samples.

	Dependent variable: Ln (Total Pay)			
	Countries with board gender quotas	Countries without board gender quotas	Countries with parental leave policies	Countries without parental leave policies
	(1)	(2)	(3)	(4)
Panel A: Nearest Neighborhood Match				
Female - Male	−15.12**	−29.81***	−10.23**	−21.70***
Significance (p-value)	0.027	0.000	0.031	0.000
Panel B: Radius Match (0.1)				
Female - Male	−22.65**	−39.97***	−17.72**	−50.25***
Significance (p-value)	0.014	0.000	0.020	0.000
Panel C: Mahalanobis Distance Matching				
Female - Male	−19.81**	−34.04***	−15.09**	−39.67***
Significance (p-value)	0.011	0.000	0.013	0.000

We match male and female executives using the nearest neighbor (Panel A), radius = 0.1 (Panel B), and Mahalanobis (Panel C) matching methods. We match the executives on cohort, positions within the board, age, tenure within the company, and the size, market-to-book ratio and industry of the appointing companies. We calculate the difference in pay for executives in countries with board gender quotas (column 1), without board gender quotas (column 2), paid parental leave policies (column 3), and without parental leave policies (column 4). Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

significant at 5% level or lower. The main result from this table is that the gender gap is smaller for executives in countries with board gender quotas, and in countries with parental leave provisions, compared to countries without gender policies.

Next, we estimate the multivariate empirical specifications to examine the gender pay gap, focusing on the country level variations. We control for country-level GII at the start of the tenure of executives as a measure of differences in prevailing gender norms. We begin with estimating our baseline specification with an indicator for the presence of mandatory board gender quotas. We present the results in panel A of Table 8. We document that the interaction of the *Female Executive* with the *Quota* dummy is positive and statistically significant at the 5% levels. The positive coefficient of the interaction does not wholly counterbalance the negative coefficient on the Female dummy. The net effect is of the magnitude of 18%, compared to the baseline gender pay gap of 34% reported in Table 4. There is no statistically significant difference in the equity component of executive pay in quota and non-quota countries by gender.[34]

In panel B of Table 8, we examine the gender pay gap in light of the parental leave provisions. The interaction term of *Female Executive* with the *Parental Leave* dummy is positive and statistically significant at the 5% level, while the *Female* dummy is not statistically significant The results are similar for specifications with total pay and equity pay as the dependent variable. These results show that parental leave provisions partially mitigate the executive gender pay gap.[35] Together, the above results indicate that both demand and supply side gender policies have some mitigating effect on the gender pay gap. We have neither the information on firm-level parental leave entitlements nor the uptake of these entitlements by individual executives. In countries with national parental leave schemes, the firm-level entitlements are likely to be an improvement over the national policy. Therefore, our approach will be a conservative estimate of the effect of such policies.

3.3. Who benefits from regulatory interventions?

In Table 5, we saw that the dynamics of the gender pay gap varies with the age of the female executives. We aim to examine if the public policies affect the gender pay gap for different sub-groups of female executives differently. We examine the interaction of our age-group dummies with the indicators for board gender quota (panel A) and parental leave provisions (panel B). We present the results in Table 9. The main focus is on the triple interactions of *Female* dummy, the country-level indicators for board gender quotas and parental leave provisions and the age group indicators.[36] We include both the level effects and double interactions.

In countries with a board gender quota, the triple interaction is positive and statistically significant for the highest age group, and not statistically significant at conventional levels for the younger age groups. In countries with a board gender quota, directors with more experience are preferred (Eckbo et al., 2019). We show that, in countries with a board gender quota, the gender pay gap is lower at the highest age group. For this sub-group, there is a pay-premium compared to female executives in the youngest age group.

In contrast, female executives in the two highest age groups are worse off compared to the two youngest age groups in countries with parental leave policies. The gender pay gap for executives in the oldest age group is higher in countries with parental leave provisions, compared to female executives in the youngest age group. Supply-side policies such as the parental leave provisions loosen the supply constraints of women with children, who are disproportionately likely to be in the youngest group. Our results show that this subgroup of young female executives benefits more from supply-side policies.

In alternate specifications, we partition the sample and estimate the gender pay gap for subsamples of countries with and without board gender quotas and countries with and without parental leave provisions. The results, reported in appendix G and appendix H, are similar to the triple difference estimates: female executives in the oldest age group has a pay-premium in countries with a board gender quota. Whereas, in countries with parental leave provisions, the youngest sub-group of female executives have a pay advantage. In countries with a board gender quota, there is a net 13.2% pay premium for female executives in the highest age group compared to similar male executives. On the other hand, in countries with parental leave provisions, the pay disadvantage is the smallest for the youngest group of female executives.

3.3.1. State-funded versus non-state funded parental leave provisions

We further examine if the funding mechanism of the parental leave provisions affects the gender pay gap. Information on employer provisions of parental leave entitlements is not systematically available. It is also not possible to systematically identify if individual executives exercised their rights to parental benefits from observational data. Therefore, our approach is to compare the countries where the state partially or fully funds the parental leave provisions compared to the countries where the state does not fund these benefits. We present the results in Table 10.

Estimating our baseline models for subsamples of countries with parental leave provisions subsidized by the state and without, we find that the youngest age group of female executives benefit in both sets of countries. There are differences in the magnitudes of the net effect. Overall, the entitlement to parental leave provisions, irrespective of the funding mechanism, seems to lower the gender pay gap for the youngest female executives.

[34] We present a difference-in-difference estimate of the executive gender pay gap around the change in board gender quota policies in appendix F. Compared to the non-quota countries, gender pay gap falls in quota countries in the post-quota period.

[35] In the absence of market frictions, the increased supply of female executives can arguably depress executive pay. However, frictions in the labour market (potential bias in hiring and promotions, endogenous sorting into more structured job roles, including gender-driven sorting) can affect the female labour supply. Moreover, women are still a minority in corporate leadership, and therefore a gradual increase number of female directors may not necessarily depress average executive pay.

[36] We examine the robustness of these results using tenure groups. The results, presented in appendix 2, are qualitatively similar.

Table 8
Regulatory interventions and gender pay gap.

Panel A	(1)	(2)	(3)	(4)
Dependent Variable:	Ln (Total Pay)		Equity (% of Total Pay)	
Female Executive	−0.229***	−0.282***	−0.003	−0.003
	(0.054)	(0.050)	(0.010)	(0.010)
Female Executive X Quota		0.104**		−0.004
		(0.040)		(0.039)
Quota	−0.395***	−0.385***	−0.092***	−0.093***
	(0.092)	(0.090)	(0.017)	(0.017)
GII	0.018**	0.017**	0.022**	0.017**
	(0.007)	(0.006)	(0.010)	(0.005)
Other Controls and Constant	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Cohort Dummies	Yes	Yes	Yes	Yes
Obs.	66,426	66,426	36,465	36,465
R^2	0.583	0.590	0.322	0.312
Panel B	(1)	(2)	(3)	(4)
Female Executive	−0.336***	−0.014	−0.001	−0.014
	(0.054)	(0.014)	(0.009)	(0.014)
Female Executive X Parental Leave		0.160***		0.023**
		(0.008)		(0.011)
Parental Leave	0.110**	0.118**	0.016**	0.160***
	(0.046)	(0.054)	(0.008)	(0.008)
GII	0.022**	0.020**	0.028**	0.025**
	(0.009)	(0.010)	(0.012)	(0.011)
Other Controls and Constant	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Cohort Dummies	Yes	Yes	Yes	Yes
Obs.	66,426	66,426	36,465	36,465
R^2	0.582	0.348	0.363	0.348

In this table, we present the effect of demand and supply-side interventions at the country level on the gender gap in total pay (columns 1 and 2) and a fraction of equity in total pay (columns 3 and 4). In panel A, we present the results for the effect of board gender quotas and in panel B for countries with parental leave provisions. All specifications include board and individual characteristics, company characteristics, industry dummies and cohort dummy. Robust standard errors clustered at the individual level are in the parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

3.3.2. *Size and industry effects*

We examine to what extent large companies or specific industries drive our results. Company size is likely to be correlated with greater visibility, director compensation, and connections. The unobservable variation in the quality of director appointments should be absorbed mostly by the company size where an individual gets her first appointment. Therefore, we examine the gender pay gap for the top decile and without the top decile in panel A of Table 11. In columns 1 and 2, we present the results without the top decile of large companies, and only for the top decile of large companies, respectively. The conditional gender pay gap without the top decile of company size is about 37%, which is qualitatively similar to the full sample result. The gender pay gap is not statistically significant for the top decile, and the gender pay gap for the top tercile (deciles 8, 9 and 10) is of the same order of magnitude as the baseline results.[37]

The primary industry classification of the company could also be a source of variation in the gender pay gap. For example, Goldin and Katz (2016) show that the gender pay gap has all but disappeared for pharmacists. We follow this argument to examine if gender gaps in high paying industries drive our results. In panel B, we examine if there are significant differences in the gender pay gap in industries with the lowest female representation (financial sector) and the highest female representation (consumer goods). We classify the industries based on their primary industry classifications. In column 4, we use the interaction of *Female* with an indicator for financial companies. In column 5, we estimate the results for a subsample of companies in the consumer goods industries. The net pay gap in column 4 from the level effect of *Female* and the interaction is higher than that of the baseline estimate: the executive gender pay gap in the financial sector is 61% - higher than that of the baseline estimates. The wider gender gap in the *Financial* sector is consistent with the results of Adams and Kirchmaier (2016) that women are at a disadvantage in these industries. In contrast, the gender pay gap in the consumer goods companies is 11%, statistically significantly lower than the baseline estimate of the executive gender pay gap. We use a Wald-test to find that the estimates of the gender pay gap for firms in the financial sector, and firms selling consumer goods are statistically significantly different from the baseline estimates at the 5% level.

3.4. *Additional results*

We perform a range of robustness and falsification tests for our main results. First, to attenuate the concern that companies from

[37] An alternate explanation is that the lack of significance in column 2 reflects the lack of power due to the relatively smaller sample for the test.

Table 9
Who benefits from regulatory interventions?

	Dependent Variable: Ln (Total Pay)			
	Panel A: Board Gender Quotas		Panel B: Parental Leave	
	(1)	(2)	(3)	(4)
Female Executive	−0.257***	−0.207**	−0.481*	−0.151
	(0.064)	(0.067)	(0.283)	(0.227)
Female Executive X Parental Leave X Age Group 2				−0.473
				(0.322)
Female Executive X Parental Leave X Age Group 3				−0.079*
				(0.041)
Female Executive X Parental Leave X Age Group 4				−0.587**
				(0.280)
Female Executive X Quota X Age Group 2		0.150		
		(0.174)		
Female Executive X Quota X Age Group 3		0.458		
		(0.298)		
Female Executive X Quota X Age Group 4		0.651**		
		(0.297)		
Female Executive X Age Group 2	−0.100	−0.121	−0.107	0.363
	(0.080)	(0.096)	(0.81)	(0.310)
Female Executive X Age Group 3	0.187*	0.298**	0.160*	0.218*
	(0.104)	(0.127)	(0.088)	(0.114)
Female Executive X Age Group 4	0.447**	0.649**	0.345**	0.889*
	(0.148)	(0.189)	(0.152)	(0.350)
Female Executive X Parental Leave			0.160*	0.180
			(0.09)	(0.138)
Parental Leave X Age Group 2			0.041	0.020
			(0.151)	(0.159)
Parental Leave X Age Group 3			0.159	0.219
			(0.181)	(0.183)
Parental Leave X Age Group 4			−0.799***	−0.877
			(0.216)	(0.218)
Quota	−0.768***	−0.732***		
	(0.094)	(0.094)		
Parental Leave			0.281*	0.321*
			(0.168)	(0.173)
Female Executive X Quota	−0.058	−0.310*		
	(0.133)	(0.182)		
Quota X Age Group 2	0.120	0.093		
	(0.079)	(0.073)		
Quota X Age Group 3	0.191**	0.142		
	(0.087)	(0.091)		
Quota X Age Group 4	0.856***	0.807***		
	(0.098)	(0.101)		
Age Group 2	0.019	0.021	−0.012	0.008
	(0.022)	(0.024)	(0.150)	(0.151)
Age Group 3	0.105**	0.100**	0.069	0.127
	(0.022)	(0.038)	(0.174)	(0.181)
Age Group 4	0.796***	0.790**	0.161	0.237
	(0.382)	(0.397)	(0.215)	(0.217)
Other Controls and Constant	Yes	Yes	Yes	Yes
Cohort	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Obs.	66,426	66,426	66,426	66,426
R^2	0.592	0.602	0.549	0.595

In this table, we present the effect of the age of the directors on the gender gap in executive pay. In panel A, we present the gender gap at different quartiles of age. We also present evidence of how age-dynamics affect the gender pay gap in countries with different institutional settings. In panel B we provide evidence on the effect of parental leave provisions on the gender gap at different age quartiles, and in panel C we report the effect of board gender quotas on gender pay gaps at different age groups. In columns 2 and 4, we present the results with the triple interactions of the institutional interventions, Female Executive, and the Age Groups. The omitted category is Age Group 1. All specifications include company and individual director related characteristics. Robust standard errors, clustered at the director-level, are in parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

certain countries can disproportionately affect the baseline results, we estimate the baseline models for groups of countries separately. In Table 12, we show that the executive gender pay gap is a common feature in all the countries: with board gender quotas, the U.S., the U.K., and Emerging Economies.

A significant concern is that the baseline results with the tenure-groups could be contaminated by survivorship bias, where we only observe the most competent female executives in the highest tenure group. To mitigate this concern, we focus on the subsample of

Table 10
State-funded vs non-state funded parental leave provisions.

	Dependent variable: Ln (Total Pay)			
	Panel A		Panel B	
	State-funded parental leave		Non-state funded parental leave	
	(1)	(2)	(3)	(4)
Female Executive	−0.367***	−0.238**	−0.476***	−0.387***
	(0.052)	(0.062)	(0.099)	(0.109)
Female Executive X Age Group 2		0.124		−0.135
		(0.083)		(0.122)
Female Executive X Age Group 3		0.101		−0.137
		(0.100)		(0.156)
Female Executive X Age Group 4		−0.426**		−0.307*
		(0.208)		(0.157)
Age Group 2		0.059**		−0.063
		(0.020)		(0.065)
Age Group 3		0.061**		−0.107
		(0.025)		(0.073)
Age Group 4		0.068*		−0.170
		(0.036)		(0.092)
Other Controls and Constant	Yes	Yes	Yes	Yes
Cohort	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes		
Obs.	7519	7519	58,780	58,780
R^2	0.565	0.588	0.701	0.720

We present the results of employer learning and the executive gender pay gap for the subsample of countries with state-funded parental leave (Panel A) and non-state funded parental leave provisions (Panel B). In odd-numbered columns, we estimate the unconditional gender pay gap, and in the even-numbered columns, we estimate the effect of employer-learning on the executive gender pay gap. All specifications include company and individual director related characteristics. Robust standard errors, clustered at the director level, are in parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 11
Company size and industry effects.

	Dependent variable: Ln (Total Pay)				
	Panel A			Panel B	
	Size decile <10	Size decile = 10	Size Deciles = 8, 9 and 10	Financial sector	Consumer goods
	(1)	(2)	(3)	(4)	(5)
Female Executive	−0.263***	−0.206	−0.279***	−0.261***	−0.265**
	(0.048)	(0.137)	(0.074)	(0.051)	(0.103)
Female Executive X Financial Sector				−0.348***	
				(0.099)	
Female Executive X Consumer Goods					0.254***
					(0.072)
Financial Sector				0.228***	
				(0.046)	
Consumer Goods					0.095**
					(0.037)
Other Controls and Constant	Yes	Yes	Yes	Yes	Yes
Cohort	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	No	No
Obs.	59,785	6641	13,281	66,426	66,426
R^2	0.596	0.689	0.669	0.592	0.388

In this table, we examine the effect of company size and industry factors on the gender gap in executive pay. In panel A, we provide results for companies in the highest decile of company size (column 1), as measured by total assets, and for the subsample of companies after removing the top decile (column 2). In column 3, we present results for the top three size deciles combined. In panel B, we provide evidence on the gender pay gap for the finance sector (lowest proportion of female executives) and the consumer goods industry (the highest proportion of female executives). Column 1 presents the results with an interaction term of Female and Finance Sector and column 2 we provide the results for the subsample of banking and financial companies. Robust standard errors, clustered at the director level, are in parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

executives whom we observe for all years of the sample period. In this subsample, we do not have any executives dropping out of the sample, and hence the concern about selection bias at the highest tenure group is mitigated. The estimates from this specification are qualitatively similar to the baseline sample. We present the results in appendix B.

Table 12
International comparisons.

	Quota countries	Non-quota countries	The U.S.	The U.K.	Emerging Econ.
	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	Ln (Total Pay)				
Female Executive	−0.107***	−0.304***	−0.573***	−0.138***	−0.315**
	(0.03)	(0.02)	(0.05)	(0.02)	(0.15)
Other Controls and Constant	Yes	Yes	Yes	Yes	Yes
Cohort	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Obs.	11,465	54,961	16,212	35,357	408
R^2	0.824	0.665	0.656	0.706	0.721

We present our baseline results for different country subsamples. We report our baseline results for countries with and without a board gender quota, for the U.S., the U.K., and the emerging economies separately. Robust standard errors, clustered at the director level are in parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Next, we use controls for previous experience of executives – like CEO, CFO, Board Chair, and experience of Audit, Nomination and Remuneration committee memberships – to estimate the gender pay gap. The gender pay gap persists after controlling for executive backgrounds. We present the results in appendix C. A further concern is that the estimated gender pay gap captures the effect of executive positions because female executives are underrepresented in the high paying positions like the CEO, and the CFO. In all our models, we control for executive positions. Additionally, we present estimates of the gender pay gap for subsamples of the main executive positions. The results, presented in appendix D, shows that the gender pay gap is statistically significant for CEOs, CFOs and the Board Chair.

One concern with our estimate of the gender pay gap in countries with board gender quotas is that gender quotas can lead to an oversupply of (displaced) male directors which can depress male executive pay. We examine this possibility by comparing the within-gender and across-gender variations in pay following the implementation of board gender quotas. The results, reported in appendix E, shows that average female executive pay increases in the post-quota period, but so does average male executive pay, albeit to a lesser extent. Therefore, we find no evidence of suppression of male pay in the post-quota period. In a similar vein, we also examine the changes in committee representation of male and female executives following board gender quotas. The results (reported in the Internet Appendices) show that the committee representation of female executives increased in the post-quota period, but the same for male executives decreased. Together, these results show the broader spillover effects of board gender quotas.

However, board quotas are likely to reflect pre-existing gender norms in the countries. The GII measure used in the baseline specifications may be co-determined with the executive gender pay gap. We attempt to estimate the cleaner effect of board gender quotas on the gender pay gap by estimating a difference-in-difference model. For this test, we construct a sample for which we have meaningful pre- and post-quota periods. We include companies from France (2011), Israel (2007), Italy (2011), Norway (2003) and Spain (2007), leading to a sample of 4836 executive directors. Using this subsample, we find a sharper decline in the gender pay gap in the post-quota period for female executives in the highest age-bracket. The results, reported in the internet appendices, corroborate the main finding that board gender quotas reduce the pay disadvantage for only the most experienced female executives.

Further, we examine the robustness of our baseline results using other forms of family policies like statutory paternal and maternal leave provisions. In our baseline specifications, we do not focus on maternity leave provisions because the implications of such policies on female labour supply are unclear (Olivetti and Petrongolo, 2017). Besides, most countries have maternity leave provisions, and the control group is primarily composed of U.S. companies. As a measure of robustness, we estimate the effect of statutory maternal leave provisions on the executive gender pay gap and find an economically small and marginally statistically significant effect (reported in the Internet Appendices). The effects of paternal leave provisions are also similar to the baseline estimates (also reported in the Internet Appendices).

Finally, we partition the sample by the duration of the parental leave provisions: long parental leaves (more than 28 days) and short parental leaves (less than 15 days). Not surprisingly, the results are stronger in the subgroup with long parental leaves than with short parental leaves (results reported in the Internet Appendices).

4. Conclusion, limitations and avenues for future research

Where do our results leave us in terms of the gender gap in executive pay? We estimate an economically meaningful and statistically significant gender pay gap: women executive directors receive 34% lower than comparable men in our large sample of companies from across eighteen countries. We show that the gender pay gap for executives is not a static feature, and the information bias acting against female executives at the point of appointment gets dissipated with new information about productivity revealed to the employer over their tenure. The effect of tenure on the pay gap is stronger for externally appointed executives, who face steeper information bias. The evolution of the gender pay gap over the tenure of cohorts suggests that employer learning about the ability of female executives partially mitigates the pay disadvantage over time. The information revelation does not overcome the gender pay gap completely, and a systematic component of the pay gap persists throughout the tenure. However, our results suggest that any gender bias at the point of the initial appointment is non-binding.

We show that regulatory interventions are, at least partially, successful in mitigating the systematic component of the executive

gender pay gap. Countries with a board gender quota seem to have a lower executive gender pay gap. Countries with strong family policies, such as parental leave provisions, also have lower executive gender pay gaps. In countries with shared parental leave, the gender pay gap is the smallest for female executives in the youngest age group, who are presumably more exposed to maternity shocks. In contrast, older and more experienced female executives benefit more in countries with board gender quotas.

These results are potentially important for the debate on the effectiveness of public policies aimed to address the gender pay gap. Different public policies aimed at reducing the gender imbalance in leadership positions seem to affect different age groups of female executives asymmetrically. It follows that the effectiveness of these interventions will depend, to a large extent, on the precise form of bias that impedes the progress of women in the executive labour market. For example, there is no conclusive evidence that affirmative actions of gender-quotas can necessarily eliminate negative stereotypes. The closure of the representation gap, although an essential metric in itself, must also be assessed in light of the overall aim of reducing gendered-barriers to leadership positions. Family policies, such as parental leave provisions that compensate the disadvantaged group of young women directly, rather than forcing employers to promote them can be an equally reliable way to address the gender imbalance.

Our study has some limitations, which opens avenues for future research. To ensure the data from various countries are comparable, we focused exclusively on the executive directors who receive board appointments. Therefore, our focus is on a narrow segment of executives. Future research could explore how the supply-side and demand-side public policies affect a broader segment of senior and middle management executives to identify the pathways to corporate leadership and the executive gender pay gap. Second, emerging research suggests that chief executives' cultural beliefs (Hechavarria et al., 2017) and gender sensitivity (Green and Homroy, 2018; Gompers and Wang, 2017) have a material impact on corporate decisions and firm outcomes. Currently, there is no large-scale data on executive-level cultural values for a global sample of firms. Future research could explore how public policies moderate the gender pay gap in firms whose leaders' cultural beliefs are feminized, and gender sensitivity is increased through personal experiences such as parenting daughters. Finally, we document that the executive gender pay gap is not uniform across industries. Indeed, women are likely to receive rapid growth and pay a premium in some industries with less-gendered entry barriers compared to industries with more gendered entry barriers than others (Ali et al., 2011). Further analysis is required to assess the mechanisms behind the evolution of the executive gender pay gap in industries with strong gender-norms and analyze how demand- and supply-side public policies affect them.

Acknowledgements

We thank Douglas Cummings, Claudia Girardone, the guest editors, and the anonymous referees for their helpful suggestions throughout the review process. We thank Renée Adams, Shantanu Banerjee, Sudipto Dasgupta, Shubhashish Gangopadhyay, Colin P. Green, Niels Hermes, Mariano Heyden, Esha Mendiratta, Johanna Rickne, Asad Rauf, and Zhifang Zhang (EFiC Discussant) for their comments and suggestions. We are grateful to the participants at the INFER Annual Conference, EFiC Banking and Finance Conference and seminar participants at the Stockholm School of Economics in Riga, University of Groningen, and Norwegian University of Science and Technology for their valuable suggestions.

Appendix A. Variable description

Variables	Description	Source
Female Executive	Dummy coded 1 if the executive director is Female	BoardEx
Total Pay ($US; T)	Total annual compensation includes Salary, Bonus, contributions towards Pension, others etc. and equity-linked compensation	BoardEx
Equity	Percentage of Equity-based pay in total annual compensation	BoardEx
Board Size	Total number of directors on the board	BoardEx
Board Independence	Total number of non-executive directors on a board	BoardEx
CEO	Dummy coded 1 if an executive is a CEO	BoardEx
CFO	Dummy coded 1 if an executive is a CFO	BoardEx
Board Chair	Dummy coded 1 if an executive is the board chairperson	BoardEx
Executive Committee Member	Dummy coded 1 if an executive is the member of any of Audit, Nomination or Compensation Committees	BoardEx
External Appointment.	Dummy coded 1 if the number of years in the executive role is the same as the number of years in the company.	BoardEx
Tenure	Number of years of tenure for an executive in a company	BoardEx
Outside Non-Executive Positions	The average number of listed boards on which an executive concurrently serves as a non-executive director	BoardEx
Age	Age of an executive	BoardEx
Num. of Qualification	Number of qualifications held by an executive	BoardEx
Total Assets ($US; M)	Total Assets of the company	Worldscope
Operating ROA	Operating Income per Total Assets	Worldscope
Tobin's Q	Total Assets minus Book Value of Equity plus the market value of Equity divided by book value of Total Assets	Worldscope
Quota	Dummy coded 1 for all years if the country has a board gender quota	Public Sources
Parental Leave	Dummy coded 1 for all years if the country has provisions for shared parental leave	World Bank (2015)

(*continued on next page*)

(*continued*)

Variables	Description	Source
Paternal Leave	Dummy coded 1 for all years if the country has provisions for paternal leave	World Bank (2015)
Maternity Leave	Dummy coded 1 for all years if the country has maternity leave entitlements	World Bank (2015)
State-Funded Parental Leave	Dummy coded 1 if the state fully or partially funds the parental leave provisions.	World Bank (2015)
Duration of Parental Leave	Parental Leave entitlement in days	World Bank (2015)
GII	Gender Inequality Index for the country	United Nations Development Program

Appendix B. Subsample of all individuals whom we observe for all years

	Dependent Variable: Ln (Total Pay)	
	(1)	(2)
Female Executive	−0.517**	−0.200**
	(0.234)	(0.082)
Female Executive X Tenure Group 2		0.126**
		(0.054)
Female Executive X Tenure Group 3		0.203**
		(0.088)
Female Executive X Tenure Group 4		0.251**
		(0.109)
Tenure Group 2		0.320**
		(0.166)
Tenure Group 3		0.185*
		(0.089)
Tenure Group 4		0.589**
		(0.170)
Other Controls and Constant	Yes	Yes
Cohort	Yes	Yes
Industry Dummies	Yes	Yes
Obs.	7474	7474
R^2	0.519	0.535

In this table, we present a test for survivorship bias in the baseline results. We estimate the baseline specifications for the subsample of executives whom we observe in our sample for all years of the sample period. Column 1 presents the unconditional pay gap, and column 2 presents the effect of employer learning on the executive gender pay gap. Robust standard errors, clustered at the individual level are in the parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix C. Controlling for previous experience

	Dependent Variable: Ln(Total Pay)		
	(1)	(2)	(3)
Female Executive	−0.619***	−0.587***	−0.476***
	(0.065)	(0.061)	(0.058)
Committee Experience	0.808***		
	(0.266)		
Female x Committee Experience	0.289**		
	(0.133)		
Chair Experience		0.385***	
		(0.043)	
Female x Chair Experience		0.663***	
		(0.194)	
CEO Experience			0.935***
			(0.030)
Female X CEO Experience			0.382***
			(0.110)
CFO Experience			0.217***
			(0.091)
Female X CFO Experience			0.138*
			(0.066)
Other Controls and Constant	Yes	Yes	Yes

(*continued on next page*)

(*continued*)

	Dependent Variable: Ln(Total Pay)		
	(1)	(2)	(3)
Cohort	Yes	Yes	Yes
Industry and Country Dummies	Yes	Yes	Yes
Obs.	66,426	66,426	66,426
R^2	0.405	0.434	0.513

In this table, we present estimates of the gender pay gap after controlling for previous experience of executives. In column 1, we control for previous experience in board committees; in column 2 experience of Board Chair and specification 3 experience of CEO and CFO. All specifications include the full set of controls, industry dummies, country dummies, and cohort dummies. Robust standard errors, clustered at the company level, are in parentheses underneath the coefficients. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix D. Gender pay gap by executive roles

	Dependent: Ln Total Pay		
	CEO	Board Chair	CFO
	(1)	(2)	(3)
Female Executive	−0.107**	−0.304*	−0.573**
	(0.049)	(0.162)	(0.235)
Other Controls and Constant	Yes	Yes	Yes
Cohort	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Obs.	26,133	19,905	9993
R^2	0.824	0.665	0.656

We present our baseline results for different country subsamples. We report our baseline results for the main executive roles separately. In columns 1,2, and 3, we estimate the gender pay gaps for CEO, Board Chair and CFOs, respectively. All specifications include the full set of controls, industry dummies and cohort dummies. Robust standard errors, clustered at the individual level are in the parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix E. Male and female pay before and after the quotas

	Mean Ln (Total Pay) -Male	Mean Ln (Total Pay) – Female	Difference (Across Gender) (p-value)
Before Board Gender Quotas	5.21	4.25	0.96 (0.016)
After Board Gender Quotas	6.17	5.45	0.72 (0.005)
Difference (Within Gender) (p-value)	0.96 (0.035)	1.20 (0.012)	

In this table, we present the univariate comparisons of mean pay of male and female directors for countries with board gender quotas. We present the differences in the total pay (ln) across the period before and after the gender quotas. The differences in the columns relate to the within-gender change in pay, and the differences in the rows refer to the across-gender change in pay following the implementation of board gender quotas.

Appendix F. Difference-in-difference estimates around changes in board gender quota policies

Dependent variable	Ln (Total Pay)	Equity (% of Total Pay)
	(1)	(2)
Female Executive x Post-Quota	0.023**	0.034**
	(0.010)	(0.013)
Female Executive	−0.050	−0.048**
	(0.013)	(0.022)
Post-Quota	0.102**	0.093**
	(0.044)	(0.038)
Control Variables$_{it-1}$	Yes	Yes
Industry Dummies	Yes	Yes
Year Dummies	No	No
N	16,261	16,261
R^2	0.296	0.264

In this table, we present the difference-in-difference estimates of the variations in the executive pay gap around changes in board gender quota policies. For this analysis, the sample consists of companies from France, Israel, Italy, Norway, and Spain. Post-Quota is all years following the board gender quota

regulations at the country-level. In column 1, we show results for total pay, and in column 2, we show results for equity compensation. All specifications include company and individual director related characteristics. Robust standard errors, clustered at the director level, are in parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix G. Split sample estimates for board gender quotas

	Dependent Variable: Ln (Total Pay)			
	Panel A		Panel B	
	Quota Countries		Non-Quota Countries	
	(1)	(2)	(3)	(4)
Female Executive	−0.346***	−0.235***	−0.368***	−0.218**
	(0.092)	(0.059)	(0.055)	(0.104)
Female Executive X Age Group 2		0.062		−0.154
		(0.068)		(0.089)
Female Executive X Age Group 3		0.128**		0.069
		(0.055)		(0.039)
Female Executive X Age Group 4		0.367***		0.100**
		(0.092)		(0.049)
Age Group 2		0.089		0.048**
		(0.066)		(0.020)
Age Group 3		0.022		0.069**
		(0.010)		(0.025)
Age Group 4		0.041**		0.065**
		(0.016)		(0.037)
Other Controls and Constant	Yes	Yes	Yes	Yes
Cohort	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Obs.	16,261	16,261	54,880	54,880
R^2	0.525	0.586	0.588	0.621

We present the estimates of executive gender pay gap by age group for the subsample of countries with board gender quotas (panel A) and without board gender quotas (panel B). In odd-numbered columns, we estimate the unconditional gender pay gap, and in the even-numbered columns, we estimate the effect of employer-learning on the executive gender pay gap. All specifications include company and individual director related characteristics. Robust standard errors, clustered at the director level, are in parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix H. Split sample estimates for parental leave provisions

	Dependent variable: Ln (Total Pay)			
	Panel A		Panel B	
	Countries with parental leave provisions		Countries without parental leave provisions	
	(1)	(2)	(3)	(4)
Female Executive	−0.317***	−0.203**	−0.511**	−0.322***
	(0.069)	(0.094)	(0.135)	(0.085)
Female Executive X Age Group 2		−0.255		0.140
		(0.421)		(0.079)
Female Executive X Age Group 3		−0.006*		0.128*
		(0.003)		(0.067)
Female Executive X Age Group 4		−0.185*		0.281**
		(0.095)		(0.102)
Age Group 2		0.033		0.041**
		(0.099)		(0.019)
Age Group 3		0.006		0.083**
		(0.013)		(0.040)
Age Group 4		0.117		0.445**
		(0.115)		(0.218)
Other Controls and Constant	Yes	Yes	Yes	Yes
Cohort	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Obs.	2115	2115	64,706	64,706
R^2	0.6050	0.6117	0.626	0.638

We present the estimates of executive gender pay gap by age group for the subsample of countries with paid parental leave provisions (panel A) and without paid parental leave provisions (panel B). In odd-numbered columns, we estimate the unconditional gender pay gap, and in the even-

numbered columns, we estimate the effect of employer-learning on the executive gender pay gap. All specifications include company and individual director related characteristics. Robust standard errors, clustered at the director level, are in parentheses. Statistical significance is expressed as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix I. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jcorpfin.2020.101857.

References

Adams, R.B., Ferreira, D., 2009. Women in the boardroom and their impact on governance and performance. J. Financ. Econ. 94 (2), 291–309.
Adams, R.B., Kirchmaier, T., 2016. Women on boards in finance and STEM industries. Am. Econ. Rev. 106 (5), 277–281.
Ahern, K.R., Dittmar, A.K., 2012. The changing of the boards: the impact on company valuation of mandated female board representation. Q. J. Econ. 127 (1), 137–197.
Ali, M., Kulik, C.T., Metz, I., 2011. The gender diversity–performance relationship in services and manufacturing organizations. Int. J. Hum. Resour. Manag. 22 (07), 1464–1485.
Altonji, J.G., Pierret, C.R., 2001. Employer learning and statistical discrimination. Q. J. Econ. 116 (1), 313–350.
Azmat, G., Ferrer, R., 2017. Gender gaps in performance: evidence from young lawyers. J. Polit. Econ. 125 (5), 1306–1355.
Bertrand, M., Hallock, K.F., 2001. The gender gap in top corporate jobs. ILR Rev. 55 (1), 3–21.
Bertrand, M., Goldin, C., Katz, L.F., 2010. Dynamics of the gender gap for young professionals in the financial and corporate sectors. Am. Econ. J. Appl. Econ. 2 (3), 228–255.
Bertrand, Marianne, Sandra E. Black, Sissel Jensen, Adriana Lleras-Muney, 2019. Breaking the glass ceiling? The effect of board quotas on female labour market outcomes in Norway. The Review of Economic Studies 86 (1), 191–239.
Blau, F.D., Kahn, L.M., 2000. Gender differences in pay. J. Econ. Perspect. 14 (4), 75–99.
Bordalo, P., Coffman, K., Gennaioli, N., Shleifer, A., 2016. Stereotypes. Q. J. Econ. 131 (4), 1753–1794.
Bugeja, M., Matolcsy, Z.P., Spiropoulos, H., 2012. Is there a gender gap in CEO compensation? J. Corp. Finan. 18 (4), 849–859.
Carter, M.E., Franco, F., Gine, M., 2017. Executive gender pay gaps: the roles of female risk aversion and board representation. Contemp. Account. Res. 34 (2), 1232–1264.
Cascio, E.U., 2009. Maternal labor supply and the introduction of kindergartens into American public schools. J. Hum. Resour. 44 (1), 140–170.
Chhaochharia, V., Ghosh, S., Niessen-Ruenzi, A., Schneider, C., 2019. Child Care Provision and Women's Careers in Firms. Available at SSRN. https://doi.org/10.2139/ssrn.2943427.
Cipollone, A., Patacchini, E., Vallanti, G., 2014. Female labour market participation in Europe: novel evidence on trends and shaping factors. IZA J. Eur. Labor Stud. 3 (1), 18.
Cools, S., Fiva, J.H., Kirkebøen, L.J., 2015. Causal effects of paternity leave on children and parents. Scand. J. Econ. 117 (3), 801–828.
Cornell, B., Welch, I., 1996. Culture, information, and screening discrimination. J. Polit. Econ. 104 (3), 542–571.
Eckbo, B.E., Nygaard, K., Thorburn, K.S., 2019. Board gender-balancing and firm value. In: European Corporate Governance Institute (ECGI) - Finance Working Paper No. 463/2016 and Tuck School of Business Working Paper No. 2746786. Available at SSRN: https://ssrn.com/abstract=2746786.
Fairfax, L.M., 2006. Clogs in the pipeline: the mixed data on women directors and continued barriers to their advancement. Maryland Law Rev. 65, 579.
Fernandes, N., Ferreira, M.A., Matos, P., Murphy, K.J., 2012. Are US CEOs paid more? New international evidence. Rev. Financ. Stud. 26 (2), 323–367.
Ferreira, D., Ginglinger, E., Laguna, M., Skalli, Y., 2017. Board quotas and director-firm matching. In: CEPR Discussion Paper No. DP12117.
Ferri, F., Maber, D.A., 2013. Say on pay votes and CEO compensation: evidence from the UK. Rev. Finance 17 (2), 527–563.
Gayle, G.-L., Golan, L., Miller, R.A., 2012. Gender differences in executive compensation and job mobility. J. Labor Econ. 30 (4), 829–872.
Gelbach, J.B., 2002. Public schooling for young children and maternal labor supply. Am. Econ. Rev. 92 (1), 307–322.
Giannetti, M., Wang, T.Y., 2020. Public Attention to Gender Equality and Board Gender Diversity. Working paper, Stockholm School of Economics and University of Minnesota.
Goldin, C., Katz, L.F., 2016. A most egalitarian profession: pharmacy and the evolution of a family-friendly occupation. J. Labor Econ. 34 (3), 705–746.
Gompers, P.A., Wang, S.Q., 2017. And the children shall lead: Gender diversity and performance in venture capital. In: National Bureau of Economic Research No. w23454.
Green, C.P., Homroy, S., 2018. Female directors, board committees and firm performance. Eur. Econ. Rev. 102, 19–38.
Gupta, V.K., Mortal, S.C., Guo, X., 2018. Revisiting the gender gap in CEO compensation: replication and extension of Hill, Upadhyay, and Beekun's (2015) work on CEO gender pay gap. Strateg. Manag. J. 39 (7), 2036–2050.
Hechavarria, D.M., Terjesen, S.A., Ingram, A.E., Renko, M., Justo, R., Elam, A., 2017. Taking care of business: the impact of culture and gender on entrepreneurs' blended value creation goals. Small Bus. Econ. 48 (1), 225–257.
Hill, A.D., Upadhyay, A.D., Beekun, R.I., 2015. Do female and ethnically diverse executives endure inequity in the CEO position or do they benefit from their minority status? An empirical examination. Strateg. Manag. J. 36 (8), 1115–1134.
Janiak, C.M., 2002. The links among golf, networking, and Women's professional advancement. Stanford J. Law Business Finance 8, 317.
Keloharju, M., Knüpfer, S., Tåg, J., 2019. What prevents women from reaching the top?. In: IFN Working Paper No. 1111 and Harvard Business School Research Paper Series no. 16-092.
Kluve, J., Schmitz, S., 2014. Social Norms and Mothers' Labor Market Attachment: The Medium-Run Effects of Parental Benefits. Available at SSRN 2471521.
Kluve, J., Tamm, M., 2013. Parental leave regulations, mothers' labor force attachment and fathers' childcare involvement: evidence from a natural experiment. J. Popul. Econ. 26 (3), 983–1005.
Lalive, R., Schlosser, A., Steinhauer, A., Zweimüller, J., 2013. Parental leave and mothers' careers: the relative importance of job protection and cash benefits. Rev. Econ. Stud. 81 (1), 219–265.
Lefebvre, P., Merrigan, P., 2008. Childcare policy and the labor supply of mothers with young children: a natural experiment from Canada. J. Labor Econ. 26 (3), 519–548.
Light, A., McGee, A., 2015. Employer learning and the "importance" of skills. J. Hum. Resour. 50 (1), 72–107.
Mansour, H., 2012. Does employer learning vary by occupation? J. Labor Econ. 30 (2), 415–444.
Matsa, D.A., Miller, A.R., 2011. Chipping away at the glass ceiling: gender spillovers in corporate leadership. Am. Econ. Rev. 101 (3), 635–639.
Matsa, D.A., Miller, A.R., 2013. A female style in corporate leadership? Evidence from quotas. Am. Econ. J. Appl. Econ. 5 (3), 136–169.
Miller, A.R., 2011. The effects of motherhood timing on career path. J. Popul. Econ. 24 (3), 1071–1100.
Olivetti, C., Petrongolo, B., 2017. The economic consequences of family policies: lessons from a century of legislation in high-income countries. J. Econ. Perspect. 31 (1), 205–230.
Ozkan, N., Singer, Z., You, H., 2012. Mandatory IFRS adoption and the contractual usefulness of accounting information in executive compensation. J. Account. Res. 50 (4), 1077–1107.

Ruhm, C.J., 1998. The economic consequences of parental leave mandates: lessons from Europe. Q. J. Econ. 113 (1), 285–317.
van Belle, J., 2016. Paternity and Parental Leave Policies across the European Union. RAND.
World Bank, 2015. Women, Business and the Law: Getting to Equal. World Bank, Washington, DC.
Xu, J., 2018. The Gender Gap in Executive Promotions. Available at. SSRN. https://ssrn.com/abstract=3100429.