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Marginal returns to talent for material risk takers in banking

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Marginal Returns to Talent for Material Risk Takers in Banking*

Abstract

Economies of scale can explain compensation differentials over time, across firms of different size, different hierarchy-levels, and different industries. Consequently, the most talented individuals tend to match with the largest firms in industries where marginal returns to their talent are greatest. We explore a new dimension of this size-pay nexus by showing that marginal returns also differ across activities within firms and industries. Using hand-collected data on managers in European banks well below the level of executive directors, we find that the size-pay nexus is strongest for investment banking business units and for banks with a market-based business model. Thus, managerial compensation is most sensitive to size increases for activities that can easily be scaled up.

Keywords: banks, business models, marginal returns to talent

JEL classification: G21, G24, G34

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1 Introduction

Economies of scale are a central concept in economics. Rosen (1981) coined the term superstar economics to capture how two similarly high-skilled individuals earn vastly different fortunes, depending on the circumstances under which they put their talent to use. For a very long time, the finance literature has focused on a specific group of superstars, namely top-managers and CEOs of corporations. Intuitively, the impact of talented top managers will increase with the resources at hand. For instance, a smart financing strategy that allows for a decrease in capital costs has a larger absolute effect when implemented in a larger corporation.

Economies of scale can explain CEO compensation differentials across firms and over time. More recent evidence supports that scalability of talent also relates to cross-sector and cross-hierarchy differences in pay. The central contribution of our paper is to document that even within a sector with high returns to talent, the nature of tasks can explain compensation differences within firms and across business models.

The group of firms we chose as a laboratory for this endeavor are European banks. This group is of special interest to policymakers and scholars alike. First, it is a sector from which we know that high excess returns to talent can be attained (Philippon and Reshef, 2012). Second, several scholars have pointed out how excessive compensation could have lead to excessive risk-taking in the run-up to the financial crisis. Consequently, understanding compensation of bankers has been the focus of numerous studies (e.g. Bhagat and Bolton, 2014; Efing, Hau, Kampkötter, and Steinbrecher, 2015). We show that the compensation of material risk takers (MRTs), which is a group of managers in European banks that is much broader than just the group of executives, depends on the activities of the business unit they are located in. To that end, we use hand-collected data on MRTs' compensation across bank business units. We collected this data from reports mandated by CRD IV disclosure rules, which were implemented in 2014.

We find that total remuneration of MRTs in investment banking business units is much more sensitive to the size of the business unit than in retail banking and business units with supportive functions. On average, we find that for each percentage point increase in relative business unit size, investment bankers earn 1% more. We argue that the underlying factor explaining these differences is heterogeneity across business units in marginal returns to talent. According to Gabaix and Landier (2008), marginal returns to talent capture how strongly the effect of talent on project size translates into increasing firm profits. We hypothesize that retail banking exhibits relatively low marginal returns to talent relative to investment banking. Even the most talented retail banker has limited impact when giving out a loan and will mostly rely on standardized credit scoring models when deciding on whether or not to grant the loan. In contrast, the occasional failures of single traders causing huge losses are an example of the tremendous impact individual investment bankers can have on their banks' performance. More generally, an exceptionally talented investment banker can easily scale up the proceeds from her ingenious asset allocation, successful trading strategy, or savvy in closing M&A deals by tailoring her approach to the needs of the specific customer and the circumstances of the specific transaction.

We go on to show that these differences in marginal returns to talent across business units also matter for the prevalence of performance pay. Célérier and Vallée (2019) argue that marginal returns to talent should determine both total compensation and the degree of variable pay. We document that the ratio of variable-to-fixed compensation exhibits the same dynamics as total compensation regarding the relationship between size and pay in different business units. More specifically, we document that for each percentage point increase in relative business unit size, the ratio of variable-to-fixed compensation of investment bankers increases by 0.5% .

Our second contribution is to show that differences in marginal returns to talent do

not only matter across different bank business units, but also across banks with different business models. We understand a bank's business model as the specific mix of activities a bank engages in. Our central business model measure compares the distribution of MRTs across the two opposite poles of a bank's range of activities, namely retail banking and investment banking, which represent traditional and non-traditional banking, respectively. We classify banks as market-focused if the ratio of MRTs in investment banking to retail banking is in the top quartile of the distribution. Using this approach, we show that MRTs in investment banking earn significantly more if they work in a market-focused bank. Investment bankers on average earn one third more in terms of total pay when their bank is market-focused, while the variable-to-fixed ratio is about 12% higher in such banks.

While the focus of our business model analysis is on the mix of activities, and here, especially on the specialization of banks, we also capture heterogeneity in the inner workings of a bank. To that end, we sum up all the MRTs in overhead, i.e., supportive functions, and relate them to the number of MRTs in the bank's profit centers, i.e., retail and investment banking. We classify a bank as low overhead if this ratio is below the sample median. We hypothesize that banks with low overhead tend to err on the side of growth in the trade-off between growth and safety, which is the central dichotomy in the model by Song and Thakor (2019) of bank culture. In the following, we use bank business model and bank culture synonymously since we regard them as two sides of the same coin. Indeed, we find that investment bankers earn even more in a market-focused bank if it is also characterized by low overhead. In the sense that low overhead can be regarded as a low degree of oversight and low bureaucratization, this result can be reconciled with a view of marginal returns to talent being higher in a setting, where talented bankers are less constrained in the scope of their actions.

Our third contribution can be regarded as a distilled version of the previous two tests.

Presumably, marginal returns to talent play the greatest role among the high earners in a bank. The disclosure rules of CRD IV define high earners as those employees that earn more than EUR 1 mln. a year. If the type of activities are as important as we deem them to be, we expect to be able to explain variation in the number of income millionaires and their compensation with our business model classification. Indeed, we find that even after controlling for bank size, a bank's focus on market-based finance is a significant determinant of high earner compensation.

Our paper contributes to two different strands of the literature. First, it relates to the literature using economies of scale to solve two distinct but related puzzles in the literature on managerial compensation. The first puzzle is the marked increase in executive pay since the mid-1980s. The second one is why this increase has been especially pronounced in the finance industry. Building on the idea of concept of superstar economics by Rosen (1981), Gabaix and Landier (2008) point to the increase in firm size and the tight relationship between size and compensation as the central explanatory factor for the increase in CEO pay. They show how the marginal returns to talent for skilled CEOs are higher in larger firms, which leads to the most talented CEOs matching with the largest firms. This size-pay nexus can also be used to explain compensation differentials within firms, namely between employees at different hierarchy levels (Mueller, Ouimet, and Simintzi, 2017). Marginal returns to talent have also been employed to explain why top managers seem to earn a premium in the finance industry. Philippon and Reshef (2012) find that this premium has emerged only after the wave of deregulation in the mid 1980s. In the decades before, tight regulation had inhibited managers' scope of action and thus rendered differences in talent largely irrelevant. Célérier and Vallée (2019) argue that in addition to regulation, the immaterial nature of banks' input differentiates marginal returns to talent in finance from industries, where operations cannot be scaled up as easily. Our contribution is to document that marginal returns to talent do not

only differ across firms, time, hierarchies, and industries but also across different types of activities as proxied by different bank business units.

Our analysis also relates to the literature on bank business models and in particular to the literature connecting business models and compensation. Song and Thakor (2019) devise a theoretical model of bank culture and show that manager incentive contracting serves to match managers and banks with similar preferences regarding the trade-off between safety and growth. Barth and Mansouri (2018) and Hagendorff, Saunders, Steffen, and Vallascas (2018) show empirically how differences in risk taking and incentive compensation can be explained via bank culture and idiosyncratic manager effects, respectively. Beyond the papers explicitly taking into account compensation, a host of papers uses a combination of various observables to cluster banks into distinct business models: funding and trading activity (Roengpitya, Tarashev, and Tsatsaronis, 2014), sources of income, funding, and activities (ECB, 2016), retail-focus and degree of diversification (Mergaerts and Vander Vennet, 2016), balance sheet composition and performance (Farnè and Vouldis, 2017), size, complexity, activities, geographic reach, funding, and ownership structure (Lucas, Schaumburg, and Schwaab, 2019). We contribute to this literature by using a new business model characterization based on the number of MRTs employed in different business units. This way we can explain variation in managerial compensation practices below the CEO-level, likely emanating from different marginal returns to talent for different types of activities.

2 Institutional setting

Bank compensation has been under intense regulatory scrutiny in the post-crisis years, which has resulted in a stream of regulations. Implementing the recommendations of the Financial Stability Board (FSB), the EU introduced the European Capital Requirements Directive (CRD) III in 2010. It regulates, among others, the minimum deferral of variable

pay of bankers to better align risk-taking incentives with long-term performance.[1] The new directive was supposed to regulate the pay of all *staff whose professional activities have a material impact on the risk profile of credit institutions*, commonly referred to as *identified staff* or *material risk takers* (MRTs).

In 2013, the EU complemented the CRD III with a new directive, the CRD IV, and an accompanying regulation, the Capital Requirements Regulation (CRR).[2] In the CRD IV, the EU introduced the so called bonus-cap which limited the ratio of allowed variable to fixed compensation for all MRTs (Colonnello, Koetter, and Wagner, 2020). Importantly for our purposes, the new set of regulations also required banks to disclose the number of MRTs and their total, fixed, and variable compensation at the aggregate level, split by business areas. In addition, banks have to disclose the number of high earners, i.e., employees earning above EUR 1 million, by payment bands of EUR 500,000. Banks have to identify MRTs based on qualitative criteria such as an employee's position (e.g. as a member of the management body or as the head of a material business unit) or the size of the loan portfolio under management by the employee and based on quantitative criteria such as the employee's total remuneration.[3]

3 Marginal returns to talent

The impact of managerial skills increases with the resources available in the situation where skills are put to use. Consequently, more skilled CEOs match with larger firms where they earn more as their marginal returns to talent are higher (Gabaix and Landier, 2008).

[1] Directive 2010/76/EU came into effect in 2011.

[2] Directive 2013/36/EU and Regulation 575/2013 both came into effect in 2014 and are commonly referred to collectively. Henceforth, we will adopt the common practice and refer to both regulations as the CRD IV.

[3] These criteria were specified in the Commission Delegated Regulation 604/2014, which in turn implemented recommendations from a technical document by the European Banking Authority (EBA), the EBA Regulatory Technical Standards 2013/11.

To structure our discussion on how the size-pay nexus varies across different activities within the finance industry, we follow the formalization of the mechanics of the size-pay nexus as presented by Célérier and Vallée (2019). Here, the firm's target function is described as:

$$T \times S^{\alpha} - S - w(T) \ , \tag{1}$$

where S is project size and $w(T)$ is the wage for a worker of talent T. The parameter α determines marginal returns to a manager's talent. Under the assumption of perfect competition at the labor demand side, firms compete for talented workers and workers have full bargaining power. Optimizing over project size S, the resulting wage takes the form

$$\begin{aligned} & w(T) = T \times S_T^{*\alpha} - S_T^* \ , \\ \text{or} \quad & w(T) = T^{\frac{1}{1-\alpha}} \alpha^{\frac{1}{1-\alpha}} (1-\alpha) \ . \end{aligned} \tag{2}$$

From equation (2) we can see that marginal returns to talent are positive. Consequently, more skilled workers, i.e., those with higher values of T, earn higher wages. In line with Gabaix and Landier (2008), more skilled individuals match with occupations related to larger projects, i.e., larger values of S. The match between talent and size can ultimately be traced back to scale returns to talent, i.e., more skilled individuals will match with occupations with higher values of α.

Célérier and Vallée (2019) go on to assume that α varies across industries and that it is higher in the finance industry than in non-finance industries. Consequently, working in finance is rewarded with a premium based on higher returns to talent. We hypothesize that α does not only differ across industries but also within one industry across different activities. Thus, companies will value talent more when hiring workers in business units

exhibiting higher returns to talent. At the same time, we conjecture that more skilled workers will select into business units with higher returns to talent.

In the context of the industry in our focus, i.e. the banking industry, we expect marginal returns to talent to MRTs to be higher in investment banking than in retail banking or overhead functions. Retail-banking is a low-margin activity generating fixed income streams. Profits are generated not from scaling up the activities of very talented individual retail bankers but rather by scaling up low-margin products like debit cards on a national or even international level. In contrast, individual talent plays a much larger role in the deal-oriented investment banking business. Here, a small number of very talented individuals can generate much higher returns to talent. For example, the same effort by a team of very talented investment bankers in M&A can generate vastly higher profits than a less talented team because the most talented M&A advisors attract clients with larger deal volumes, i.e., higher values of S. Hence, we expect more talented investment bankers to match with banks, where the investment banking business is more important, compared to other business units. Empirically, we would expect compensation to rise more strongly with increasing relative business unit size for material risk takers in investment banking units compared to other business units. This reflects higher marginal returns to talent, i.e., higher values of α in investment banking.

4 Business models

In the previous section, we laid out why the relationship between business unit size and material risk takers' pay should be stronger in investment banking across all banks. Still, the size-pay nexus for investment banking will not be the same across all banks. We expect that marginal returns to talent for investment bankers in banks with a particular focus on investment-banking should be even higher than in a bank with a similarly sized investment banking business unit but with a business model focused more on traditional

banking such as retail banking. Grouping banks into different business models will thus help us to refine our analysis of heterogeneity in the strength of the size-pay nexus across banks and business units.

We define business models along the dimension of a bank's market focus. The two opposite poles regarding a bank's activities are investment banking, i.e., capital market-focused activities, and traditional retail banking (Gorton and Metrick, 2012). We determine a bank's market focus by relating the number of material risk takers in the investment banking business unit to the number of MRTs in retail banking. We consider banks in the middle of the domain, i.e, those with a less pronounced focus on either market-based or retail-based finance, as universal banks.[4]

While a bank's activities represent an outside view on its business model, we also want to use the inside view for our business model classification. To that end, we summarize all business units that are not the actual profit centers of a bank into an aggregate overhead business unit and compare the number of MRTs in overhead to the number of MRTs in the profit centers, i.e., retail- and investment banking. We assume that the relative weight of overhead functions like compliance, HR, and risk control reflects how much a bank relies on bureaucratization and control to rein in risk takers in profit centers and thus sheds light on a bank's self-positioning in the trade-off between safety and growth as described in Song and Thakor (2019). While we think that this is a reasonable assumption, we acknowledge that the weight of overhead functions could also to some degree reflect bank complexity, e.g. the complexity of a bank's corporate structure.

[4]Note that in our empirical analysis, we concentrate on either market- or retail focused banks. We do not estimate separate coefficients for universal banks as they constitute the reference group.

5 Empirical approach

5.1 Size-pay nexus across banks

In the first step of our analysis we investigate the relation between bank-size and the pay level of MRTs. In contrast to Gabaix and Landier (2008) who only look at CEOs, we analyze the compensation of below-CEO level employees, namely the MRTs. We implement this analysis running regressions of the following form:

$$y_{ijt} = \beta_1 s_{it} + \beta_2 s_{ijt} + \beta_3 n_{ijt} + \mathbf{1}\boldsymbol{f}_{it} + \epsilon_{ijt}, \tag{3}$$

where i, j, and t denote the bank, business unit, and year, respectively. Our MRT-level compensation measure, y_{ijt}, is the logarithm of the sum of total annual pay of all MRTs in a given business unit.[5] Our main independent variables are the size measures, s_{it} and s_{ijt}. We use the logarithm of a bank's total assets s_{it} to capture firm size. We complement the aggregate bank-level measure of firm size with a new measure of relative business unit size, s_{ijt}, which relates the number of MRTs in a given business unit to the total number of MRTs in the entire bank. By incorporating this measure into the analysis, we point out that it is not just the total size of a bank that determines pay-levels of employees, but also the relative importance of a business unit within a bank in which employees work. Like this, we prepare the ground for the second step of our analysis, which entails the analysis of heterogeneity in the size-pay nexus across different types of business units.

We argue that our MRT-based relative size indicator offers several advantages relative to measures based on bank financials or simple headcounts of all employees in a business unit. Our measure does not depend on the subjective process of identifying

[5]For cases where a bank does not report any information for one or more of the eight EBA business units, we assume that this business unit does in fact not exist in the given bank. When a given business unit comprises two EBA categories we split compensation and number of MRTs evenly across relevant EBA categories.

the accounting-based measure that most adequately reflects a business unit's size and it abstracts from non-essential employees, which do not necessarily inform on the relative importance of a business unit within a bank.

Since we are using the sum of total pay as a dependent variable, it is important to control for the (logarithm of) the absolute number of MRTs in a given business unit, n_{ijt}. Furthermore, we add different sets of fixed effects, f_{it}, which include time fixed effects, bank fixed effects, and business unit fixed effects. While bank fixed effects control for a bank's culture and business model, business unit fixed effects control for business-unit-specific compensation culture, e.g., general pay differences among MRTs in investment banking relative to MRTs in retail banking. Note that bank fixed effects encompass country fixed effects and thus control for unobserved time-invariant differences in bank compensation and reporting standards across countries.

5.2 Size-pay nexus across business units

We now turn to the heterogeneity of the size-pay nexus across business units. For this analysis, we aggregate the eight EBA business units to three business units to sharpen our analysis and to avoid overfitting. As we focus on key personnel below the management board, we exclude the EBA categories *management body in its supervisory function* and *management body in its management function*. These two categories do not constitute business units in the actual sense and their compensation is not comparable to the remaining business units.[6] Moreover, we exclude the business unit *asset management* due to the low number of banks within our sample, which have an asset management unit. Lastly, we summarize the business units *corporate functions*, *independent control function*, and the residual category *all other* in a new business unit, which we call overhead. As discussed in chapter 4, these business units do not represent a profit center but rather

[6]For example, in some banks and jurisdictions MRTs in the *management body in it supervisory function* only receive attendance fees for supervisory meetings and no variable pay.

perform support and control functions. Thus, it is a natural choice to use the overhead business unit as the reference category in our regressions looking into heterogeneity across business units. We run regressions of the following form:

$$y_{ijt} = \boldsymbol{\beta}_1 \boldsymbol{b}_j + \beta_2 s_{ijt} + \boldsymbol{\beta}_3 \boldsymbol{b}_j s_{ijt} + n_{ijt} + \boldsymbol{\lambda} \boldsymbol{c}_{it} + \mathbf{1} \boldsymbol{f}_{it} + \epsilon_{ijt}, \tag{4}$$

where i, j, and t denote the bank, business unit, and year, respectively. In addition to the dependent variable from Equation (3), the logarithm of the total pay of all MRTs in a given business unit, we now also look at a measure of variable pay, namely the aggregate ratio of variable to fixed compensation for all MRTs in a business unit. The vector b_j comprises indicator variables for the three business units retail banking, investment banking, and overhead. Our main variable of interest is the interaction of the business unit indicators with our business-unit-specific size measure, s_{ijt}, which is defined by the ratio of MRTs in a business unit over the total number of MRTs in a bank as described further above. The coefficients in $\boldsymbol{\beta}_3$ capture the heterogeneity in the size-pay nexus across business units. The strength of each coefficient provides a measure for the marginal returns to talent, γ, prevalent in the respective business unit. We hypothesize that γ will be largest for the investment banking business unit, where we except the highest marginal returns to talent as laid out in Section 3. We also expect marginal returns to talent to increase the degree of performance pay. Thus, β_3 should be also highest for investment banking when using the variable-to-fixed compensation ratio as the dependent variable.

The bank-specific size measure (the logarithm of total assets), s_{it}, from Equation (3) has been relegated to the vector of bank-control variables, $\boldsymbol{c}_{it}$, which also comprises the return on average assets and the cost-to-income ratio as measures of profitability and efficiency, respectively. Moreover, we keep on controlling for the logarithm of the number of MRTs in a each business unit, n_{ijt}, to prevent that our effects are driven by simple mechanical correlations.

5.3 Size-pay nexus across business models

We further investigate if heterogeneity in marginal returns to talent also emanates from bank business models. The degree to which a bank resorts to non-traditional banking is captured by our market focus indicator, which relates the number of MRTs in the investment banking business unit to the number of MRTs in the retail banking unit. We divide the indicator into three categories so that bank-years in the upper quartile and bank-years in the lower quartile represent a high and low degree of market focus, respectively. Banks that fall into the middle category can be thought of as universal banks, which have a more even distribution of MRTs across business units, reflecting a business model balanced between traditional and non-traditional banking.

While the market focus indicator captures the banks profit centers, we also want to analyze how a high degree of overhead affects the size-pay nexus. To that end, we relate the number of MRTs in the aggregate overhead business unit to the number of MRTs in investment banking and retail banking. We dichotomize our indicator by setting it equal to one if the overhead share is below the median within our sample. A low overhead share would reflect a low degree of bureaucratization and overhead and thus a bank that tends to prefer safety over growth. By controlling for the cost-to-income ratio we make sure that a low overhead share does not simply reflect a high degree of efficiency.

In our analysis of business models we exclude the business-unit specific size measures, s_{ijt}, to prevent collinearity with the bank-year specific business model indicators. Apart from that, we employ the control variables and fixed effects structure from Equation (4), which leads to the following regression equation:

$$y_{ijt} = \boldsymbol{\beta}_1 \boldsymbol{b}_j + \beta_2 bm_{it} + \boldsymbol{\beta}_3 \boldsymbol{b}_j bm_{it} + n_{ijt} + \boldsymbol{\lambda} \boldsymbol{c}_{it} + \mathbf{1} \boldsymbol{f}_{it} + \epsilon_{ijt}, \tag{5}$$

where the bank-year level business model indicator is denoted bm_{it}. First, we run re-

gressions with only one of two business model measures interacted with the business unit indicators and then we run combined regression, where the main variable of interest is the triple interaction of market focus, low overhead, and the respective business unit indicator, i.e., retail banking or investment banking.[7] We hypothesize that total and variable compensation is highest for banks with a high market-focus and low overhead corresponding to a situation, where marginal risk takers in the business unit with the highest marginal returns to talent, i.e., investment banking, are least restrained by bureaucracy and oversight.

5.4 Size-pay nexus and high earners

We now turn away from MRTs to the analysis of high earners, which are defined as income millionaires. While the data that is publicly available is at the bank-level and therefore does not allow us an analysis of heterogeneity across business units, the high earners provide an ideal testing ground for the relationship between the size-pay nexus and a bank's business model. We would expect that the most important determinant for the number of high earners is the degree of a bank's market focus. We therefore run regressions of the form:

$$y_{it} = \beta_1 bm_{it} + \beta_2 s_{it} + \boldsymbol{\lambda} \boldsymbol{c}_{it} + \mathbf{1} \boldsymbol{f}_{it} + \epsilon_{it}, \tag{6}$$

where i and t denote bank and year, respectively. Our dependent variable is either the number of high earners or the total pay of all high earners within a bank. Given that there is less heterogeneity and a lower number of observations in a bank-level setting, we favor power over the ease of interpretation and use a continuous version of the categorical market focus indicator from the previous chapter. Our business model measure, bm_{it}, is thus simply the ratio of the number MRTs in investment banking over the number

[7] Recall that the aggregate overhead business unit serves as the reference category

of MRTs in retail banking. Our coefficient of interest is the strength of the connection between a bank's market focus and the number and pay of high earners, captured by β_1.

Note that in specification (6), we explicitly report coefficient estimates of bank size s_{it}. This allows us to directly relate the nexus between business model and pay to the size-pay nexus. We would expect that bank size has a positive impact on the number of high earners, i.e. a positive and significant coefficient estimate β_2. If the impact of a bank's business model is also meaningful for its pay policies, we would also expect a positive coefficient estimate for bank business model, i.e. a positive and significant coefficient estimate β_1.

6 Data and summary statistics

We hand-collect data on MRTs and high earners in European banks over the period 2014 to 2018. As discussed in Section 2, the beginning of our sample period is defined by the implementation of regulatory publication requirements on MRT pay in the CRR. We restrict our data collection effort to the sample of 124 banks that took part in the 2014 EBA stress test.[8]

According to EBA guidelines, banks have to split up the information on their MRTs by eight business areas: i) *the management body in its supervisory function*, ii) *the management body in its management function*, iii) *investment banking*, iv) *retail banking*, v) *asset management*, vi) *corporate functions* (such as HR and IT), vii) *independent control functions* (such as risk management, compliance and internal audit), and the residual category viii) *all others*.[9] Moreover, the EBA guidelines require banks to disclose the number of high earners according to bins of 500,000 EUR.

We find information on MRTs and high earners in a wide variety of report types,

[8] See https://eba.europa.eu/risk-analysis-and-data/eu-wide-stress-testing/2014 for the list of institutions included. Among this group of banks, we find at least some information on MRTs and high earners for 95 institutions.

[9] EBA guidelines EBA/GL/2014/08

predominantly in annual reports, special reports on compensation practices, and CRR reports. Most institutions base their disclosure on MRTs and high earners on the EBA templates, as discussed in Section 2. Figure A.1 and Figure A.2 show an example of a table for disclosure on MRTs and a table for disclosure on high earners, respectively. In those cases, where the categories in the MRT-table do not perfectly match the official EBA nomenclature of the eight business units listed in Section 2, we hand-match them to the closest EBA category.

Table 1 depicts summary statistics for a collapsed version of our main dataset, i.e., a bank-year panel. Here, each bank-year observation carries all the information of the associated business units. Balance sheet variables and MRT variables are winsorized at the 1st and 99th percentiles. Refer to Appendix Table A.1 for variable definitions. In Table 2, we split the sample of banks based on our business model measure capturing the degree of market focus. The univariate evidence points in the direction of the hypothesis developed in Section 5, i.e., banks with a high market focus exhibit higher average pay of MRTs in all business units but especially in investment banking. Moreover, we observe higher numbers of high earners in banks with a stronger market focus. However, the stark differences in total assets highlight the need for the multivariate regressions featured in the following section.

In addition to the non-parametric evidence on the role of bank business models, we provide visual evidence on the size-pay nexus across banks and business units. Figure 1 exhibits the cross-sectional size-pay nexus. Depending on the size of the bank, MRTs in all business units tend to earn more, which arguably reflects higher marginal returns to talent in larger banks in line with Gabaix and Landier (2008). Figure 2 provides visual evidence regarding our main hypothesis from Section 2. The relationship between the size of the business unit, as gauged by our MRT-based size measure, and compensation of MRTs is strongest for investment banking. Again, this arguably reflects relatively higher

marginal returns to talent in business units related to investment banking.

7 Results

7.1 Size-pay nexus across banks and business units

We examine the well-established size-pay nexus by first looking at the classical measure of size, namely bank total assets. In columns 1-3 of Table 3, we document that MRTs in larger banks command a significantly higher total salary. Since our dependent variable is measured at the level of MRTs in a business unit rather than simply looking at CEO pay, our results also corroborate Mueller et al. (2017)'s result that differences in marginal returns to talent also determine compensation differences within a bank. In columns 4-6, we show that our MRT-based size measure captures variation in the size-pay nexus above and beyond total assets. For each percentage point increase in the relative size of a business unit, we find a roughly 0.6% increase in total compensation. In all columns, we control for the number of MRTs in each business unit to make sure that our results are not simply driven by the mechanical relationship between the number of MRTs and the total aggregate pay of MRTs in the respective business unit. Note that our results hold across different sets of fixed effects that either control for time-invariant compensation culture in business units, banks or for the combination of both.

Next, we turn to the analysis of heterogeneity across business units. To that end, we interact our MRT-specific size measure with business unit indicators for investment banking, retail banking, and the aggregate overhead business unit. In columns 1-3 of Table 4, we again look at total pay of MRTs in each business unit and find evidence for our central hypothesis regarding the importance of marginal returns to talent. MRTs in investment banking earn significantly more than MRTs in the reference category (overhead) across three specifications controlling for time-varying factors at the bank-level, the number of MRTs in a business unit, and time-invariant compensation cultures at the

business-unit and bank-level. The coefficient in column 3 suggests that for each percentage point increase in the relative size of the investment banking unit, we find a roughly 1.5% increase in total compensation, while the same effect is only 0.5% for MRTs in the overhead business units (the reference category).

At the same time, we do not find an effect for retail banking, which arguably reflects lower marginal returns to talent associated with the activities conducted in that business unit. In columns 4-6 of Table 4, we look at the ratio of variable to fixed pay of MRTs in each business unit. While we do not find an effect in the specification with business unit fixed effects only, in the remaining two specifications we find a positive compensation differential for MRTs in investment banking and only a weak positive effect for MRTs in retail banking. The results in Table 4 suggest that indeed marginal returns to talent, or γ in the terminology of Equation 1, are highest in investment banking, which leads to positive compensation differentials of MRTs in investment banking business units regarding both total and variable-to-fixed compensation.

7.2 Size-pay nexus across business models

Now we turn to the analysis of bank business models and test to what extent compensation is not only determined by heterogeneity in activities across business units but also by differences in the specialization in activities and the positioning in the trade-off between growth and safety across banks.

In Table 5, we interact our first business model measure, which captures the degree of a bank's market focus by relating MRTs in investment banking to MRTs in retail banking, with the business unit indicators. In columns 1-3, we find that banks with a market focus in the top quartile of the distribution exhibit significantly higher pay for investment bankers relative to MRTs in overhead, while we do not find a similar effect for retail banking. When looking at variable-to fixed compensation, the picture becomes

even starker. Here, we find a significant positive effect for MRTs in investment banking if they work in a bank with a high market focus, while the variable-to-fixed compensation ratio is significantly lower for MRTs in retail banking.

While in the previous analysis we took the outside view at a bank's specialization in activities, we now examine the inside view of a bank's business model. We compare banks with different degrees of bureaucracy and oversight, proxied by the ratio of MRTs in overhead business units to MRTs investment and retail banking. In Table 6, we show that MRTs in investment banking in banks with below median bureaucracy and oversight command higher pay. However, the results only hold for the case of total pay and in the specification with business unit fixed effects. Apparently, the inside view alone does not give us enough power to find compensation differentials.

This is why in Table 7, we combine the inside and the outside view on a bank's business model in a triple interaction regression. In columns 1-3, we find that retail bankers and to an even larger degree investment bankers earn more in terms of total pay in banks with low overhead. The effect is magnified in banks whose business model is both characterized by low overhead and a high degree of market focus. The additional effect only exists for investment bankers. This confirms our hypothesis that MRTs engaging in activities with high marginal returns to talent command even higher pay when they are less constrained by bureaucracy and oversight. This result does not extend to the case of variable-to-fixed pay in columns 3-6. We do, however, find that MRTs in retail banking earn less variable pay when a bank is market-focused. This suggests that the degree of bureaucracy and oversight does not play a large role for bonus payouts relative to the specialization of a bank.

7.3 Size-pay nexus and high earners

Our analysis of high earners can be regarded as a distillation of the tests we have conducted so far. Income millionaires are a natural choice for an examination of the relationship between marginal returns to talent and compensation. We hypothesize that the specialization in activities a bank engages in is the key factor in determining the distribution of income millionaires across banks. Specifically, we want to test whether our business model indicator capturing the degree of a bank's market focus is able to predict the number and compensation of income millionaires even after controlling for bank size. In Table 8, we use the continuous version of our market focus indicator and compare its effect on the number of high-earners and their total pay with the effect of bank size. In panel A, we look at total pay and find that our business-model indicator trumps the influence of bank size as soon as we control for both bank and time fixed effects. We find the same dynamics when looking at the total number of high earners in panel B.

8 Conclusion

Economies of scale determine compensation across firms of different size, across different hierarchy levels, and across different industries. We explore a new dimension of the interplay between marginal returns to talent, scale, and managers' compensation by documenting heterogeneity in returns to talent in one sector, i.e., the European banking industry, along the specific types of activities in which institutions engage. More specifically, we investigate if pay structure patterns are compatible with differences in marginal returns to talent across different business units and across different business models.

We make use of hand-collect data on compensation of material risk takers, which is available due to post-crisis disclosure requirements. These data comprise information on pay of managers not limited to top management, and are split by business units.

We document that within larger business units, employees receive higher pay. This

effect is especially pronounced for investment bankers. Talented retail bankers have little leeway to scale up talent, as their business is highly standardized. In contrast, investment bankers regularly work in small teams handling specific investment products, trading strategies, or M&A deals. Here, a talented banker can have a much larger impact on outcomes. Consequently, the impact of a talented investment banker on a specific project is scaled up relatively more with increasing project size.

We go on to show that compensation also depends on the specialization of a bank. We classify banks into business models along two dimensions. On the one hand, we look at the degree of market focus of a bank. On the other hand, we consider the importance of supportive and controlling overhead functions. We find that investment bankers earn more in market-focused banks. Pay for investment bankers is even higher at market-focused banks when the importance of overhead functions is low and investment bankers are less restricted in their freedom of action. Furthermore, the degree of market focus is also the central determinant of the number of high earners, i.e, those with annual income of more than EUR 1 mln., at the bank-level. In summary, we show that differences in marginal returns to talent associated with different activities within the banking industry are an important driver of compensation patterns for managers below the CEO level.

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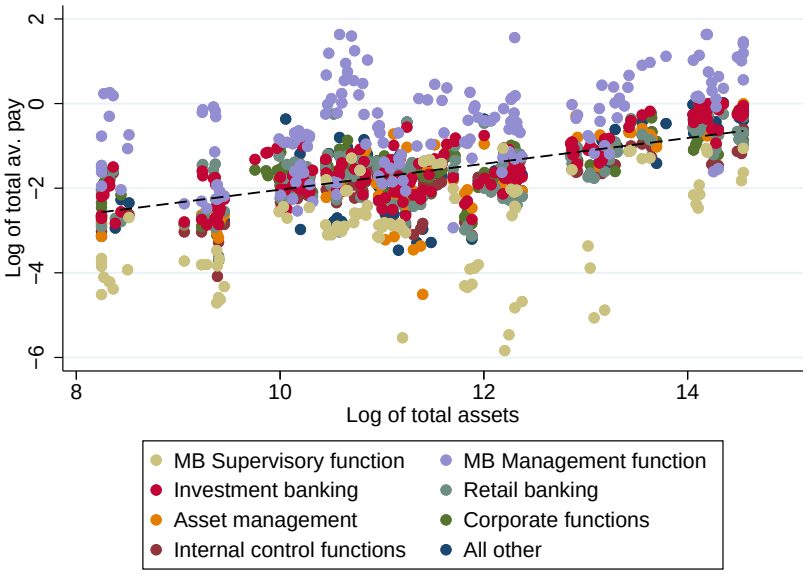

Figure 1: Size-pay nexus and bank size This figure visualizes the relationship between firm size, measured by the logarithm of total assets, and average compensation of MRTs in European banks over the period 2014 to 2018. Each dot represents the logarithm of total average pay of MRTs in a particular bank-year in one of the eight business units specified by the EBA. The black dashed line is a fitted regression line.

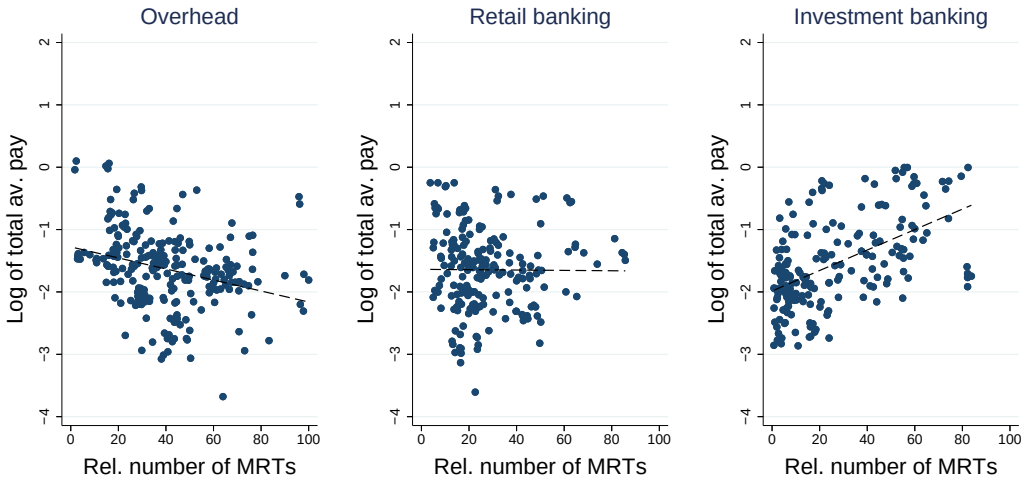

Figure 2: Size-pay nexus and business unit size This figure visualizes the relationship between business unit size and average compensation of MRTs in European banks over the period 2014 to 2018 in three different business units. Business unit size is proxied by the number of MRTs in each business unit relative to the total number of MRTs in the respective bank-year. Each dot represents the logarithm of total average pay of MRTs in a particular bank-year for the business units *overhead*, *retail banking*, and *investment banking*, respectively. The *overhead* business unit is an aggregate cateogry summarizing the business units *corporate functions*, *independent control function*, and the residual category *All Other*. The black dashed lines are fitted regression lines.

Table 1: Summary statistics
This table shows summary statistics for our European sample banks over the period 2014-2018. Both bank characteristics and business unit characteristics are reported at the bank-level. Refer to Appendix Table A.1 for variable definitions.

	N	Average	S.E.	p25	Median	p75
Bank characteristics						
Total assets (mln. EUR)	181	344,409.345	555,646.069	34,424.242	70,634.766	381,295.000
ROA (in %)	181	0.228	0.860	0.100	0.330	0.590
Cost-to-income ratio	181	0.649	0.197	0.553	0.622	0.716
Market-to-retail ratio	181	1.468	2.898	0.111	0.375	1.182
Overhead-to-profit-center ratio	181	0.358	0.177	0.229	0.332	0.467
MRT characteristics:						
Number of MRTs	181	436.729	609.121	74.000	158.000	534.000
Rel. BU size (overhead)	181	0.358	0.177	0.229	0.332	0.467
Rel. BU size (retail)	181	0.279	0.171	0.165	0.239	0.366
Rel. BU size (inv. banking)	181	0.188	0.208	0.030	0.098	0.283
Average pay of MRTs in inv. banking (mln. EUR)	181	0.248	0.253	0.083	0.167	0.305
Average pay of MRTs in retail (mln. EUR)	181	0.247	0.168	0.127	0.205	0.296
Average pay of MRTs in overhead (mln. EUR)	181	0.254	0.191	0.142	0.209	0.290
Total number of high earners	146	45.404	121.875	0.000	2.000	12.000
Total pay of high earners	146	83.176	230.153	0.000	3.750	21.500

Table 2: Summary statistics

This table shows summary statistics for our European sample banks over the period 2014-2018. Both bank characteristics and business unit characteristics are reported at the bank-level. Banks with market focus exhibit a market-to-retail ratio in the top quartile. Banks with retail focus exhibit a market-to-retail ratio in the bottom quartile. Refer to Appendix Table A.1 for variable definitions.

	Banks with market foucs				Banks with retail focus			
	N	Average	S.E.	Median	*N*	Average	S.E.	Median
Bank characteristics								
Total assets (mln. EUR)	46	911,091.430	723,478.530	545,479.000	46	73,338.307	123,253.520	37,525.342
ROA (in %)	46	0.153	0.401	0.260	46	0.228	0.706	0.360
Cost-to-income ratio	46	0.698	0.166	0.674	46	0.664	0.157	0.639
Market-to-retail ratio	46	4.857	4.187	3.315	46	0.023	0.037	0.000
Overhead-to-profit-center ratio	46	0.274	0.128	0.286	46	0.386	0.185	0.367
MRT characteristics:								
Number of MRTs	46	908.191	850.638	612.500	46	141.459	149.262	76.500
Rel. BU size (overhead)	46	0.274	0.128	0.286	46	0.386	0.185	0.367
Rel. BU size (retail)	46	0.146	0.071	0.138	46	0.377	0.224	0.295
Rel. BU size (inv. banking)	46	0.493	0.150	0.479	46	0.008	0.013	0.000
Average pay of MRTs in inv. banking (mln. EUR)	46	0.480	0.307	0.413	46	0.052	0.092	0.000
Average pay of MRTs in retail (mln. EUR)	46	0.359	0.190	0.329	46	0.194	0.078	0.192
Average pay of MRTs in overhead (mln. EUR)	46	0.351	0.224	0.275	46	0.196	0.086	0.203
Total number of high earners	43	126.349	196.723	20.000	33	2.242	3.437	0.000
Total pay of high earners (mln. EUR)	43	225.372	373.743	29.500	33	4.235	7.060	0.000

Table 3: Size-pay nexus for banks and business units
This table reports estimates from regressions of total pay of material risk takers (MRTs) on characteristics of banks and business units. The sample covers all business units for EU banks between 2014 and 2018 and has a bank-business unit-year structure. The independent variables are log(*BU size)*), which is the logarithm of the total number of MRTs by business unit, log(*Total assets*), which is the logarithm of total assets of a bank, and *Rel. BU size* (columns 4 to 6), which is the number of MRTs within a business unit over the total number of MRTs by bank. All columns include time fixed effects, columns 1, 3, 4, and 6 include business unit fixed effects and columns 3 and 6 include bank fixed effects. Robust standard errors are clustered at the level of banks and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	log(Total pay)					
	(1)	(2)	(3)	(4)	(5)	(6)
log(BU size))	0.824***	0.850***	0.850***	0.764***	0.714***	0.771***
	(0.043)	(0.023)	(0.023)	(0.057)	(0.055)	(0.034)
log(Total assets)	0.356***	0.259	0.259	0.380***	0.250*	0.279*
	(0.047)	(0.157)	(0.157)	(0.053)	(0.136)	(0.147)
Rel. BU size (in %)				0.007**	0.007*	0.006***
				(0.003)	(0.004)	(0.002)
Time FE	X	X	X	X	X	X
Business unit FE	X		X	X		X
Bank FE		X	X		X	X
Mean(y)	1.592	1.592	1.592	1.592	1.592	1.592
S.D.(y)	1.732	1.732	1.732	1.732	1.732	1.732
R^2	0.872	0.936	0.936	0.876	0.849	0.938
N	1,086	1,086	1,086	1,086	1,086	1,086

Table 4: Size-pay nexus for retail vs. investment banking
This table reports estimates from regressions of total pay of material risk takers (MRTs) and the ratio of variable pay to fixed pay of MRTs on characteristics of banks and business units. The sample covers the business units overhead, retail banking, and investment banking for EU banks between 2014 and 2018 and has a bank-business unit-year structure. The independent variables are *Rel. BU size*, which is the number of MRTs within a business unit over the total number of MRTs by bank, *RB*, which is a dummy variable that takes the value of one if a business unit is related to retail banking, *IB*, which is a dummy variable that takes the value of one if a business unit is related to investment banking, and interactions of *Rel. BU size* and business unit indicators *RB* and *IB*. In all columns, we use log(*BU size)*), which is the logarithm of total number of MRTs by business unit, log(*Total assets*), which is the logarithm of total assets of a bank, *ROA* and *Cost-to-income ratio* as control variables. All columns include time fixed effects, columns 1, 3, 4, and 6 include business unit fixed effects and columns 3 and 6 include bank fixed effects. Robust standard errors are clustered at the level of banks and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	log(Total pay)			log(Variable-to-fixed)		
	(1)	(2)	(3)	(4)	(5)	(6)
Rel. BU size	0.003	0.005***	0.005***	0.003	-0.000	-0.000
	(0.003)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)
RB × Rel. BU size (in %)	0.007	-0.000	-0.000	-0.001	0.002*	0.002*
	(0.005)	(0.003)	(0.003)	(0.004)	(0.001)	(0.001)
IB × Rel. BU size (in %)	0.016***	0.010***	0.010***	0.004	0.005***	0.005***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)
Time FE	X	X	X	X	X	X
Business unit FE	X		X	X		X
Bank FE		X	X		X	X
Controls	X	X	X	X	X	X
Mean(y)	2.256	2.253	2.253	0.288	0.288	0.288
S.D.(y)	1.787	1.789	1.789	0.343	0.343	0.343
R^2	0.956	0.987	0.987	0.448	0.811	0.811
N	498	496	496	498	496	496

Table 5: Size-pay nexus for high vs. low market focus
This table reports estimates from regressions of total pay of material risk takers (MRTs) and the ratio of variable pay to fixed pay of MRTs on characteristics of banks and business units. The sample covers the business units overhead, retail banking, and investment banking for EU banks between 2014 and 2018 and has a bank-business unit-year structure. The independent variables are *Market-focus*, which is an indicator variable that takes the value of minus one if a bank's market-to-retail ratio is in the bottom quartile within our sample, one if a bank's market-to-retail ratio is in the top quartile within our sample and zero otherwise, *RB*, which is a dummy variable that takes the value of one if a business unit is related to retail banking, *IB*, which is a dummy variable that takes the value of one if a business unit is related to investment banking, and interactions of *Market-focus* and business unit indicators *RB* and *IB*. In all columns, we use log(*BU size)*), which is the logarithm of the total number of MRTs by business unit, log(*Total assets*), which is the logarithm of total assets of a bank, *ROA*, and *Cost-to-income ratio* as control variables. All columns include time fixed effects, columns 1, 3, 4, and 6 include business unit fixed effects and columns 3 and 6 include bank fixed effects. Robust standard errors are clustered at the level of banks and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	log(Total pay)			log(Variable-to-fixed)		
	(1)	(2)	(3)	(4)	(5)	(6)
Market-focus	-0.106	-0.101*	-0.101*	-0.017	0.019	0.019
	(0.089)	(0.054)	(0.054)	(0.045)	(0.058)	(0.058)
RB		-0.041			0.005	
		(0.034)			(0.010)	
IB		-0.018			0.069***	
		(0.054)			(0.025)	
Market-focus × RB	-0.031	-0.024	-0.024	-0.015	-0.031**	-0.031**
	(0.051)	(0.041)	(0.041)	(0.018)	(0.014)	(0.014)
Market-focus × IB	0.610***	0.331***	0.331***	0.203***	0.118***	0.118***
	(0.128)	(0.069)	(0.069)	(0.056)	(0.034)	(0.034)
Time FE	X	X	X	X	X	X
Business unit FE	X		X	X		X
Bank FE		X	X		X	X
Controls	X	X	X	X	X	X
Mean(y)	2.234	2.234	2.234	0.281	0.281	0.281
S.D.(y)	1.830	1.830	1.830	0.337	0.337	0.337
R^2	0.952	0.986	0.986	0.474	0.792	0.792
N	442	442	442	442	442	442

Table 6: Size-pay nexus for low vs high overhead
This table reports estimates from regressions of total pay of material risk takers (MRTs) and the ratio of variable pay to fixed pay of MRTs on characteristics of banks and business units. The sample covers the business units overhead, retail banking, and investment banking for EU banks between 2014 and 2018 and has a bank-business unit-year structure. The independent variables are *Low overhead*, which is a dummy variable taking the value of one if a bank's overhead-to-profit-center ratio is below the median within our sample, *RB*, which is a dummy variable that takes the value of one if a business unit is related to retail banking, *IB*, which is a dummy variable that takes the value of one if a business unit is related to investment banking, and interactions of *Low overhead* and business unit indicators *RB* and *IB*. In all columns, we use log(*BU size)*), which is the logarithm of total number of MRTs by business unit, log(*Total assets*), which is the logarithm of total assets of a bank, *ROA*, and *Cost-to-income ratio* as control variables. All columns include time fixed effects, columns 1, 3, 4, and 6 include business unit fixed effects and columns 3 and 6 include bank fixed effects. Robust standard errors are clustered at the level of banks and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	log(Total pay)			log(Variable-to-fixed)		
	(1)	(2)	(3)	(4)	(5)	(6)
Low overhead	0.123	-0.031	-0.031	0.026	0.050	0.050
	(0.122)	(0.083)	(0.083)	(0.059)	(0.037)	(0.037)
RB		-0.026			0.023	
		(0.047)			(0.014)	
IB		0.019			0.108***	
		(0.056)			(0.038)	
Low overhead × RB	0.088	0.031	0.031	-0.006	-0.010	-0.010
	(0.062)	(0.052)	(0.052)	(0.026)	(0.021)	(0.021)
Low overhead × IB	0.353**	0.149	0.149	0.048	0.010	0.010
	(0.138)	(0.099)	(0.099)	(0.060)	(0.047)	(0.047)
Time FE	X	X	X	X	X	X
Business unit FE	X		X	X		X
Bank FE		X	X		X	X
Controls	X	X	X	X	X	X
Mean(y)	2.219	2.219	2.219	0.286	0.286	0.286
S.D.(y)	1.789	1.789	1.789	0.330	0.330	0.330
R^2	0.947	0.984	0.984	0.426	0.787	0.787
N	478	478	478	478	478	478

Table 7: Size-pay nexus along market-focus and overhead dimensions
This table reports estimates from regressions of total pay of material risk takers (MRTs) and the ratio of variable pay to fixed pay of MRTs on characteristics of banks and business units. The sample covers the business units overhead, retail banking, and investment banking for EU banks between 2014 and 2018 and has a bank-business unit-year structure. from 2014 to 2018. The independent variables are *Market-focus*, which is and indicator variable that takes the value minus one if a bank's market-to-retail ratio is in the bottom quartile within our sample, one if a bank's market-to-retail ratio is in the top quartile within our sample, and zero otherwise, *Low overhead*, which is a dummy variable taking the value of one if a bank's overhead-to-profit-center ratio is below the median within our sample, *RB*, which is a dummy variable that takes the value of one if a business unit is related to retail banking, *IB*, which is a dummy variable that takes the value of one if a business unit is related to investment banking, and interactions of *Market-focus*, *Low overhead*, and business unit indicators *RB* and *IB*. In all columns, we use log(*BU size)*), which is the logarithm of total number of MRTs by business unit, log(*Total assets*), which is the logarithm of total assets of a bank, *ROA*, and *Cost-to-income ratio* as control variables. All columns include time fixed effects, columns 1, 3, 4, and 6 include business unit fixed effects and columns 3 and 6 include bank fixed effects. Robust standard errors are clustered at the level of banks and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.1 for variable definitions.

Dependent variable:	log(Total pay)			log(Variable-to-fixed)		
	(1)	(2)	(3)	(4)	(5)	(6)
Low overhead	0.089	-0.110	-0.110	0.026	0.046	0.046
	(0.129)	(0.079)	(0.079)	(0.065)	(0.038)	(0.038)
RB		-0.147***			-0.019	
		(0.052)			(0.020)	
IB		-0.190**			0.041	
		(0.072)			(0.045)	
Low overhead × Market focus	0.084	-0.060	-0.060	0.121	-0.083	-0.083
	(0.145)	(0.070)	(0.070)	(0.076)	(0.064)	(0.064)
RB × Low overhead	0.245***	0.168***	0.168***	0.037	0.040	0.040
	(0.076)	(0.058)	(0.058)	(0.026)	(0.030)	(0.030)
IB × Low overhead	0.282**	0.214**	0.214**	-0.016	0.025	0.025
	(0.108)	(0.084)	(0.084)	(0.056)	(0.050)	(0.050)
Market focus	-0.126	-0.052	-0.052	-0.074	0.075	0.075
	(0.107)	(0.067)	(0.067)	(0.044)	(0.083)	(0.083)
RB × Market-focus	-0.126*	-0.104	-0.104	-0.041***	-0.044***	-0.044***
	(0.075)	(0.064)	(0.064)	(0.014)	(0.015)	(0.015)
IB × Market-focus	0.394***	0.172**	0.172**	0.100	0.079*	0.079*
	(0.121)	(0.072)	(0.072)	(0.061)	(0.042)	(0.042)
RB × Market-focus × Low overhead	0.048	0.063	0.063	0.027	0.004	0.004
	(0.078)	(0.067)	(0.067)	(0.021)	(0.020)	(0.020)
IB × Market-focus × Low overhead	0.244*	0.274***	0.274***	0.119	0.074	0.074
	(0.136)	(0.094)	(0.094)	(0.079)	(0.045)	(0.045)
Time FE	X	X	X	X	X	X
Business unit FE	X		X	X		X
Bank FE		X	X		X	X
Controls	X	X	X	X	X	X
Mean(y)	2.234	2.234	2.234	0.281	0.281	0.281
S.D.(y)	1.830	1.830	1.830	0.337	0.337	0.337
R^2	0.958	0.987	0.987	0.500	0.796	0.796
N	442	442	442	442	442	442

Table 8: High-earners and relative importance of investment banking
This table reports estimates from regressions of outcomes at the level of high earners on firm size and business model characteristics. The sample covers all EU banks between 2014 and 2018 and has a bank-year structure. High earners is defined by regulation as staff earning more than one mln. EUR a year. In Panel A, the dependent variable is *Total pay of high earners* and in Panel B the dependent variable is *Total number of high earners*. The independent variables are log(*Total assets*), which is the logarithm of total assets of a bank, and *Market-to-retail ratio*, which is the ratio of material risk takers (MRTs) in investment banking over MRTs in retail banking. In all columns we use *ROA*, and *Cost-to-income ratio* as control variables. All columns include time fixed effects and all even columns include bank fixed effects. Robust standard errors are clustered at the level of banks and displayed in brackets below parameter estimates. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.1 for variable definitions.

Panel A: Total pay of high earners

Dependent variable:	Total pay of high-earners					
	(1)	(2)	(3)	(4)	(5)	(6)
log(Total assets)	66.518**	-12.603	52.076***	-65.748		
	(24.940)	(36.767)	(17.959)	(93.542)		
Market-to-retail ratio			21.769	11.868***	30.935*	11.197***
			(14.968)	(3.181)	(17.488)	(2.307)
Time FE	X	X	X	X	X	X
Bank FE		X		X		X
Controls	X	X	X	X	X	X
Mean(y)	79.626	84.450	79.626	84.450	79.626	84.450
S.D.(y)	225.383	231.504	225.383	231.504	225.383	231.504
R^2	0.305	0.948	0.395	0.953	0.259	0.952
N	153	144	153	144	153	144

Panel B: Total number of high earners

Dependent variable:	Total number of high earners					
	(1)	(2)	(3)	(4)	(5)	(6)
log(Total assets)	36.466***	-9.481	28.631***	-32.940		
	(13.043)	(20.172)	(9.383)	(45.399)		
Market-to-retail ratio			11.810	5.239***	16.849*	4.903***
			(7.509)	(1.434)	(8.937)	(1.008)
Time FE	X	X	X	X	X	X
Bank FE		X		X		X
Controls	X	X	X	X	X	X
Mean(y)	43.497	46.132	43.497	46.132	43.497	46.132
S.D.(y)	119.358	122.571	119.358	122.571	119.358	122.571
R^2	0.326	0.958	0.420	0.962	0.273	0.961
N	153	144	153	144	153	144

Appendix for "Marginal Returns to Talent for Material Risk Takers in Banking"

	Managers and Board of Directors	Investment banking	Retail banking	Asset management	Support functions	Control function	Others	Total
Number of personnel identified	*23*	*328*	*232*	*23*	*92*	*80*	*4*	*782*
Of which number of personnel identified and deferred	*2*	*265*	*67*	*12*	*36*	*18*	*4*	*404*
Total remuneration	4.9	173.4	69.8	11.5	27.6	18.5	2.2	308.0
Of which fixed amount	3.2	87.6	45.4	6.0	18.1	12.7	1.2	174.1
Of which variable amount	1.8	85.9	24.5	5.5	9.5	5.8	1.0	133.9

Figure A.1: MRT-table from remuneration report, Crédit Agricole 2018 This figure shows an exemplary excerpt from a remuneration report complying with CRD IV disclosure rules on MRT-level compensation. Banks are required to report fixed and variable compensation and the total number of MRTs across different business units at yearly frequency.

Total remuneration	France	Europe (excluding France)	Rest of the world
Between €1,000,000 and €1,500,000	5	6	4
Between €1,500,000 and €2,000,000	1	1	1
Between €2,000,000 and €2,500,000	1	1	1
Between €2,500,000 and €3,000,000	1	-	1

Figure A.2: High-earners-table from remuneration report, Crédit Agricole 2018 This figure shows an exemplary excerpt from a remuneration report complying with CRD IV disclosure rules on the number of income millionaires or *high earners*. Banks are required to report the number of income millionaires within bins of 500,000 EUR.

Table A.1: Definition of variables

Variable	Databases	Definition
Bank-level		
Cost-to-income ratio	Bankscope and Bankfocus	Non-interest expenses over the sum of net interest income and other operating income.
Low overhead	Hand-collected	Indicator equal to one if a bank's overhead-to-profit-center ratio is below the median within our sample.
Market focus	Hand-collected	Indicator equal to minus one if a banks' market-to-retail ratio is in the bottom quartile in our sample, equal to one if a bank's market-to-retail ratio is in the top quartile and zero otherwise.
Market-to-retail ratio	Hand-collected	Ratio of a bank's total number of MRTs related to investment banking over total number of MRTs related to retail banking.
Overhead-to-profit-center ratio	Hand-collected	Ratio of a bank's overhead staff over total number of MRTs from investment banking and retail banking.
ROA	Bankscope and Bankfocus	Return on average assets.
Total assets	Bankscope and Bankfocus	Total assets.
Total number of high earners	Hand-collected	Total number of high earners, which are defined as staff that earning at least EUR 1 mln. a year.
Total pay of high earners	Hand-collected	Total pay of all high earners within a bank, which are defined as staff that earns at least EUR 1 mln. a year.
Business unit-level		
BU size	Hand-collected	Total number of MRTs in a business unit.
IB	Hand-collected	Indicator equal to one if a business unit is related to investment banking.
Rel. BU size	Hand-collected	Total number of MRTs in a business unit over total number of MRTs in a bank.
RB	Hand-collected	Indicator equal to one if a business unit is related to retail banking.
Total pay	Hand-collected	Total pay of material risk takers within a business unit.
Variable-to-fixed	Hand-collected	Ratio of total variable pay over total fixed pay within a business unit.

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