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An International Look at the Growth of Modern Finance†

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Studies of long-run evolution of the finance industry have largely focused on the United States. These studies reveal three key facts: 1) the share of aggregate income spent on financial intermediation is time varying; 2) the unit cost of financial intermediation is relatively flat; and 3) the pattern of changes in human capital and wages in finance relative to the whole economy exhibits a U-shape over the twentieth century. In this paper, we ask whether these facts hold for a set of other economies with similar levels of development.

Over the long run, the US financial sector has grown in two waves: The first lasted from (at least) 1860 to the 1930s; and then, following a sharp decline, the second wave starts in 1950 and lasts to the present. The long-run trend of the income share of finance in the United States is similar to that in a number of other now-industrial economies, although—as Figure 1 illustrates—the exact pattern varies by country. A few features in Figure 1 stand out. First, in all of these countries—except Finland, for a brief period—finance's share of income today is significantly higher than it has been during the last 150 years. Second, the overall trend is upward, although periods of decline are evident; in particular, there are sharp drops in Australia after 1888 and in Canada and the United States after 1933 following severe depressions. Third, while the Netherlands, the United

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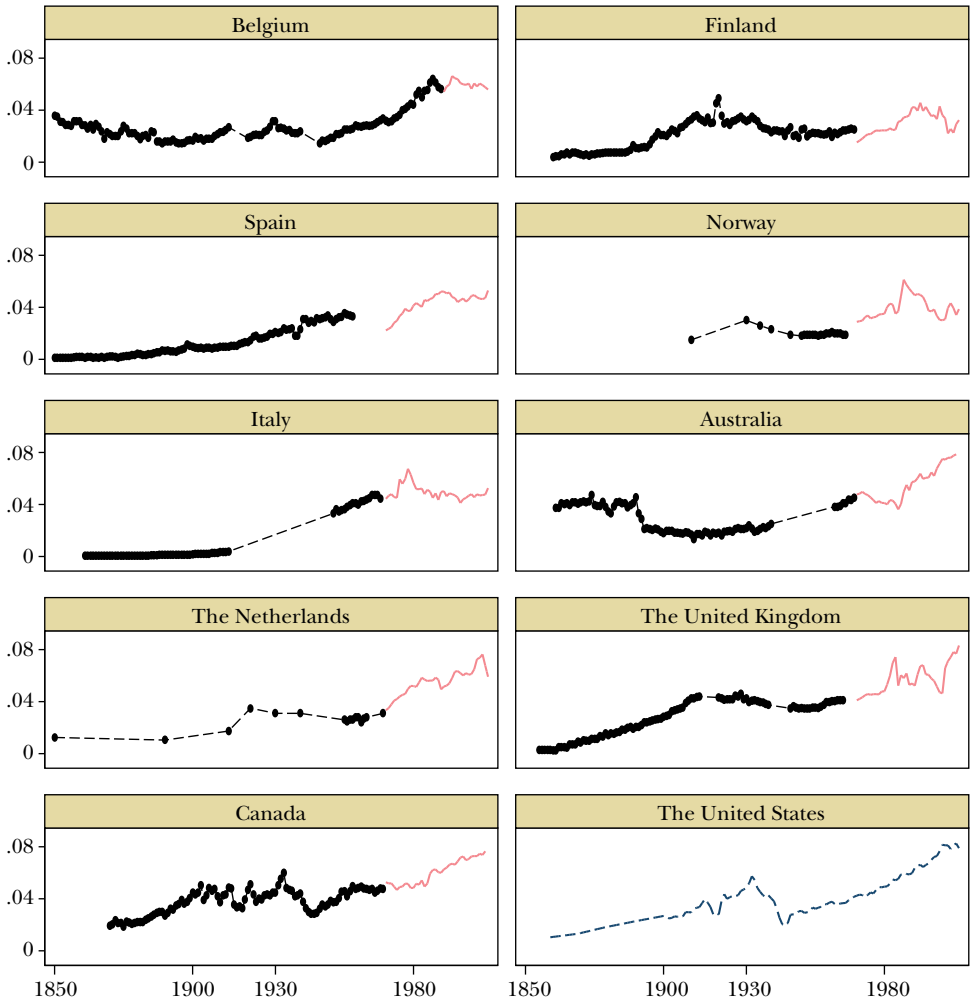
Figure 1
Historical Income Share of the Financial Sector, 1850–2007



Sources: The historic series is mostly from Smits, Woltjer, and Ma (2009) and from various historical statistical sources: Australia in 1861–1939 from Vamplew (1987); Canada in 1870–1926 from Urquhart (1993) and in 1926–1976 from Statistics Canada; Italy in 1958–1968 from Istituto Centrale Di Statistica (various years); The Netherlands in 1921–1969 from Office Statistique des Communautes Europeennes (1966) and den Bakker and de Gijt (1990); Norway in 1910–1960 from the Central Bureau of Statistics of Norway, *Historical Statistics 1968* (1969). Modern data are either from STAN (OECD) or EU KLEMS. Discrepancies between STAN and EU KLEMS data are insignificant. EU KLEMS data are described in O'Mahony and Timmer (2009). The raw historic value added in finance and GDP series for the UK are volume indices; to get the value added share in the UK we assume that the unit cost of financial services divided by the unit cost of GDP (the GDP deflator) is constant from 1970 going backwards. See the online Appendix for complete details.
Notes: Black dots represent historical sources, solid lines represent modern sources. The dashed line for the USA series is from Philippon (2012); this series combines several sources. The historic and modern income share series are the value added of financial intermediation (without real estate) as a share of GDP.

Kingdom, and Canada share the long-run pattern of the rise of finance with the United States, where finance continues to increase after 1980 (and Australia more recently), it seems that in other economies the financial sectors' income share reaches a plateau, and even declines somewhat. Notice also the similarities in the series for Canada and the United States, for the Netherlands and United Kingdom, and for Finland and Norway; these pairs have historically integrated financial sectors. Finally, it is important to understand that these patterns are not explained by the general increase in the income share of services or the decline of agriculture: Figure 1 is qualitatively unchanged when we compute the share of finance in services alone.

What forces can explain the historical growth of the income share of the finance industry as documented in Figure 1? Simple neoclassical models are not likely to provide adequate answers. Explanations that are based on two-sector models with productivity growth differentials—in which there is either low elasticity of substitution in demand and slower productivity growth in finance *à la* Baumol (1967), or elastic demand and faster productivity growth in finance—are also not satisfactory. Philippon (2012) finds that the unit cost of finance relative to other output in the United States is flat (with a slightly higher level from the 1980s and on); this in itself rules out both of the above mechanisms, as the income share of finance varies even when the unit cost does not change. Philippon (2012) argues that a benchmark model predicts a flat share of income for the finance industry, but that changes in industry structure (young firms, capital-intensive projects) or changes in demographics (inequality) should affect the income share of the finance industry.

Another common suggestion is that the growth of the financial sector is linked to globalization, but at a minimum, this relationship is not straightforward. If the relationship was monotone, then the end of the first era of globalization and the collapse of the gold standard in 1914 should have reduced the size of the financial sector. Instead, the growth of finance only slows down in some countries, while it accelerates in several others countries, including Belgium, the Netherlands, Canada, and the United States. The recovery in the size of finance from its mid-twentieth century low and the acceleration of its growth happen before globalization takes off in the 1990s for several countries. And although the Bretton Woods era (1945–71) seems to coincide with no growth in the income share of finance in some countries, in others—Belgium, the United States—it rises (for long-run trends in globalization see Obstfeld and Taylor 2004).

If richer individuals and households have a higher propensity to save, then they may demand more financial services. Thus, we may expect to find higher demand for financial services when inequality is higher. We find some support for this hypothesis in recent times, with significant increases in inequality in the United States, the United Kingdom, and Canada, commensurate with a growing income share for the financial sector after 1980. But inequality in the Netherlands does not increase, and Australia sees only moderate increases in inequality as do most other

countries. Also the recent increases in inequality are typically dwarfed by long-run drops in inequality, while finance rises for all countries.[1]

Another hypothesis is that an increase in the degree of specialization can explain the observed patterns. According to this hypothesis, the finance industry performs more tasks that have been done by households (and thus were not previously measured in value added)—like managing savings for retirement—and takes the role of more traditional sources of finance—like shop credit. While such changes are plausibly part of the story, it is difficult to find data to help evaluate how important this force is. For more recent times, Greenwood and Scharfstein (this issue) document an increase in revenue from active management in the United States, but even this cannot explain the bulk of the increase in the US financial sector.

In what follows, we examine some additional aspects of the growth of finance in order to provide some facts with which any theory of this phenomenon should be consistent. We first examine the relationship between the size of the financial sector and income per capita. We find that the income share of the finance industry rises with income in early stages of development, but that relationship does not hold for medium levels of development. Moreover, not all countries in our sample exhibit rising finance shares in more advanced stages of development. We also discuss the relationship between the size of the financial sector and economic growth. We then turn to examine the income share of the finance industry since 1970 in more detail. We also consider skill intensity and wages in finance relative to the whole economy as another potential source of the rise in the income share of the finance industry. We find that demand for skill in finance increases with information and communication technology investments and with financial deregulation, but that wages in finance are only related to the former, not the latter. We then ask whether the cost per unit of financial services has risen in tandem with the income share of finance; we reject this hypothesis. We also discuss potential changes in the quality of financial services that are difficult to observe. In the conclusion, we draw together a number of insights from our discussion and highlight some new questions they raise.

The Size of the Financial Sector and Income

One potential explanation for the growth of finance is that there is greater relative demand for it as income rises (that is, preferences for financial services are nonhomothetic). For example, Buera and Kaboski (2012a) argue that such forces led to the rise of the service sector. As mentioned above, patterns in the growth of finance show it to be over and above the growth of services more broadly,

[1] The inequality data are taken from the World Top Incomes Database, constructed by Facundo Alvaredo, Tony Atkinson, Thomas Piketty, and Emmanuel Saez (website: http://topincomes.g-mond.parisschoolofeconomics.eu/) and from the University of Texas Inequality Project (website: http://utip.gov.utexas.edu/).

so explanations for the rise of the services sector are not sufficient to explain the growth of the financial sector.[2]

We examine the relationship between the income share of the finance industry and average income (real GDP per capita), using data from Maddison (2010). Since income (in logs) progresses with time more-or-less linearly, Figure 1 is also a good representation of the relationship of the income share of the finance industry to income per capita.[3] Almost all countries—Belgium and Australia being the notable exceptions—see the finance industry income share rise at early stages of development. After that, all countries except the United States exhibit a relatively flat share of finance. It is difficult to attribute the common flat part in the middle range of development to disruption due to the period from World War I through World War II because the timing is not consistent across countries and, moreover, incomes continues to rise. While the United States, the United Kingdom, Canada, and the Netherlands see an additional significant rise at higher levels of development, Finland, Spain, Norway, and Italy do not. The pattern for Belgium is different, but we see that at the very highest levels of development, the income share of the finance industry is flat there, too.

We examine the relationship between finance and income in another way, using a proxy for financial sector output. We use data on bank loans to nonfinancial entities: firms in the private sector, government, and households, from Schularick and Taylor (2012) for a sample of 14 now-industrial countries in 1870–2008. The sample of countries is: Australia, Canada, Switzerland, Germany, Denmark, Spain, France, Italy, Japan, the Netherlands, Norway, Sweden, the United Kingdom, and the United States. The proxy for financial output is given by the ratio of these bank loans to GDP. While this is a partial measure of financial output (many other forms of financial intermediation are neglected, as well as insurance), the data have the benefit of being a consistent historical time series. This series is relatively more informative in earlier periods, and for countries that have a relatively more bank-oriented financial system.

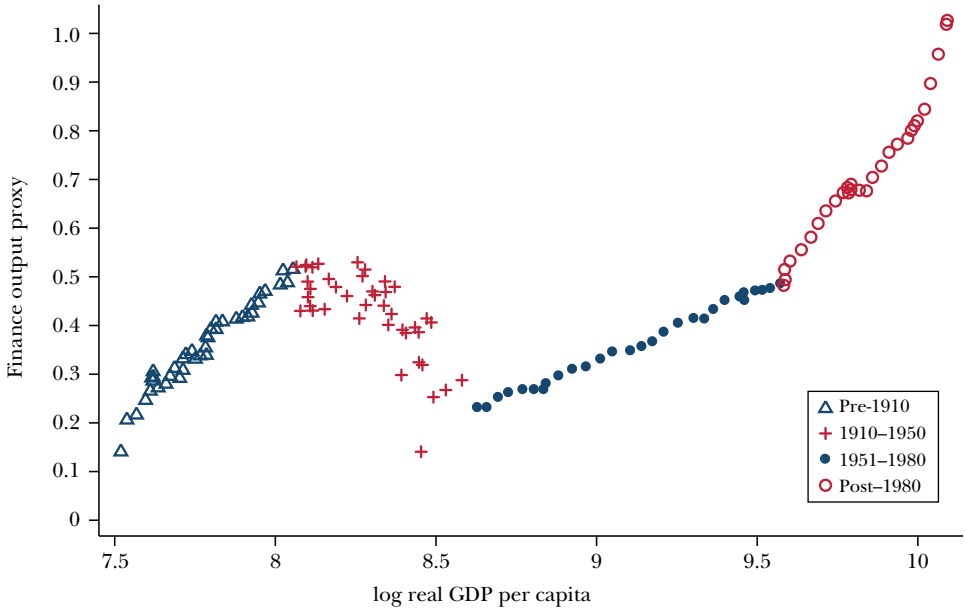
To obtain the average relationship between income and our proxy for financial output in the sample, over time, we fit fixed effects regressions of the type $y_{i,t} = c_i + d_t + \varepsilon_{i,t}$, where y is either log real GDP per capita or bank loans/GDP, c_i capture time-invariant country-specific factors, d_t capture common year-specific factors, and $\varepsilon_{i,t}$ is a projection error. Figure 2 plots the d_t from the regression where y is log real GDP per capita, against d_t from the regression where y is bank loans/GDP.

Four distinct periods are highlighted in Figure 2. Until 1910, financial output and income grow together. The tumultuous period of 1910–1950 exhibits a negative relationship: Income continues to grow, while finance contracts. In the postwar period, after 1950, financial output grows with income. But after 1980

[2] Buera and Kaboski (2012b) argue that scale economies can help explaining increasing sizes of industries and shifts in the composition of the economy. However, Philippon (2012) estimates that financial output is produced at constant returns to scale in the United States.

[3] For more detail, see Figure A2 in the online Appendix available with this paper at http://e-jep.org.

Figure 2
Finance Output and GDP Per Capita



Notes: The figure reports the relationship between the average finance output proxy and average real GDP per capita in a sample of 14 countries over 1870–2008. The finance output proxy is bank loans to nonfinancial entities (firms in the private sector, government, and households), from Schularick and Taylor (2012), divided by GDP. Real GDP per capita (in 1990 prices) is from Maddison (2010). The sample of countries is: Australia, Canada, Switzerland, Germany, Denmark, Spain, France, Italy, Japan, the Netherlands, Norway, Sweden, the United Kingdom, and the United States. Each observation is a year. We fit fixed effects regressions $y_{i,t} = c_i + d_t + \varepsilon_{i,t}$, where y is either log real GDP per capita or bank loans/GDP, c_i are country fixed effects and d_t are year fixed effects. The figure reports the relationship between the year fixed effects from the bank loans/GDP regression with the year fixed effects from the log real GDP per capita regression.

the relationship changes: The proportional change (elasticity) of financial output with respect to income is much higher after 1980 relative to 1951–1980. Alternatively put, relative to the period before 1980, the same proportional change in financial output is related to a smaller rise in income. Statistical analysis confirms that the change between post- and pre-1980 is not only economically large but also statistically significant.[4] Notice that in the later periods, as financial innovations expand the scope of financial intermediation, the proxy of financial output we are using here (bank loans/GDP) increasingly *understates* financial output, especially for countries like the United States, Canada, the United Kingdom, and the Netherlands. Securitization, and the removal of loans (mortgages) off banks'

[4] Restricting attention to the US economy delivers similar results. See Table A1 and Figure A3 in the online Appendix available with this paper at http://e-jep.org.

balance sheets reinforce this tendency to understate. It is therefore even more surprising to see that the financial output proxy, thus measured, increases even more rapidly in later periods relative to income.

Overall, we see that most of the rise in living standards after 1870 was obtained with less income spent on finance and less financial output than what is observed after 1980; and the relationship between financial output and income has changed after 1980.

It is also worthwhile noting that in this sample both the income share of finance and our proxy for financial output are not correlated with *growth* in GDP per capita; if anything, there is a small negative correlation after 1950. We do not suggest that finance is not important for growth; sustaining income growth over such a long period may very well be related to the fact that finance has been able to grow, or remain at substantial levels. Indeed, in broad cross sections of countries, finance is positively related to growth; see Rousseau and Sylla (2003) and Levine (2005). But in this sample, the secular rise of financial output does not seem to deliver *faster* growth. Several theories predict a positive relationship between expenditure on the financial sector's screening or monitoring services and growth—for example, Greenwood and Jovanovic (1990) and Greenwood, Sanchez, and Wang (2010), respectively—but this is not the case in this sample.[5]

Laeven, Levine, and Michalopoulos (2012) develop a theory in which the technology for screening new projects becomes less efficient for newer innovations (which are typically more complex and less easily understood); thus, growth ceases without financial innovation. In their model, the income share of finance is constant. But if newer screening technology becomes proportionately more costly to operate (not a feature of their model), then a constant growth rate may be consistent with a growing income share of the finance industry, at least for a while.

Recent Cross-Country Patterns of the Growth of Finance

Although many high-income countries have seen a rise of the financial sector over the long run, in recent times the experience of the US financial sector has been distinctive in a number of ways. In this section, we describe and discuss these differences using data from the European Union KLEMS dataset in 1970–2006; we restrict the sample to countries that report data on most variables of interest from the early 1970s. The sample of countries is: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Japan, the Netherlands, Sweden, the United Kingdom, and the United States. The data were downloaded from http://www.euklems.net/; see O'Mahony and Timmer (2009) for a summary of the methodology and construction of this database.

[5] Other prominent papers relating finance to growth include Bencivenga and Smith (1991), Levine (1991), King and Levine (1993), Obstfeld (1994), and Aghion, Howitt, and Mayer-Foulkes (2005). These papers investigate different mechanisms by which the financial sector can enhance growth.

Figure 3 reports the income share of the finance industry, defined as above as value added in finance divided by total value added (that is, GDP). The countries in Panel A exhibit consistently increasing income shares of finance after 1970. These countries share the recent trend with the United States, and they all end the sample with a share greater than 6 percent of GDP. Overall, the US financial sector starts among the lowest in terms of income share and ends up among the highest. The increase of finance's income share in the United States is second only to that of the Netherlands.

We juxtapose the increasing trends in Panel A with those of the countries in Panel B, which exhibit relatively flat (Denmark) or mixed trends. Within this group there is considerable variation: for example, the income share of Belgium's financial sector increases by 3 percentage points and then declines slightly; France and Sweden see a sharp increase followed by a fall almost to initial levels, and Germany sees a weak increase. These financial sectors of Panel B countries all end the period with a share smaller than 6 percent of GDP. The different trends within this group, and relative to countries in Panel A, show that recently the growth of finance is not a uniform phenomenon.

We next turn to describing wages in finance relative to the whole economy, that is, the finance industry relative wage. Average wages in finance are given by the ratio of labor compensation in finance to (full-time equivalent) employment in finance. The relative wage of finance is given by dividing average wages in finance by average wages in the whole economy, similarly computed. Labor compensation includes wages, salaries and supplements, employers contributions to social programs, tips, and—importantly for our purposes—bonuses and executive compensation. However, labor compensation does not include income from the exercise of stock options, or the share of proprietors' income that is accrued as compensation for labor services of owners of businesses. For example, this measure misses the income of hedge fund partners (but not that of their employees) that accrues to their labor services. Disentangling hedge fund partners' "labor income" from proprietors' capital income is not possible given the available sources.

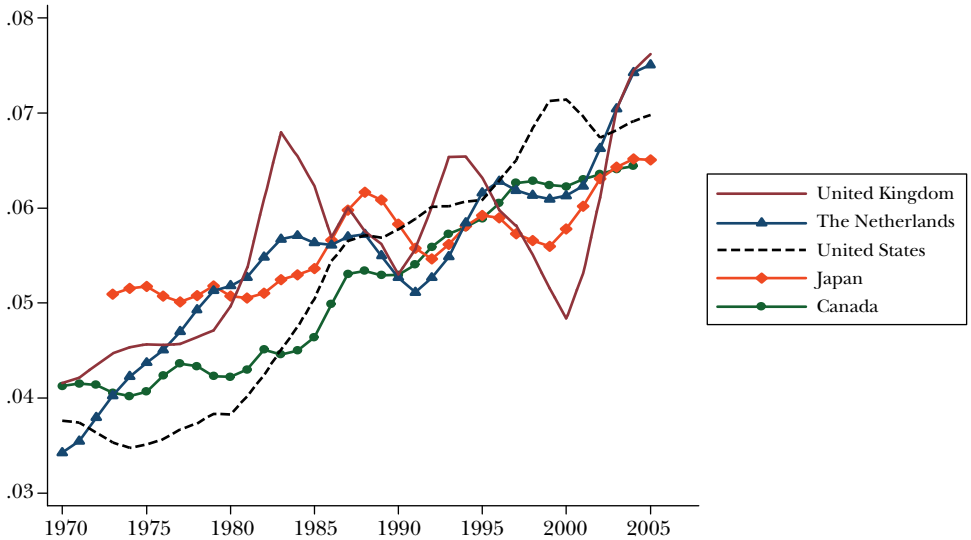
Figure 4 reports the relative wage in the finance industry (the average wage in finance relative to the average wage in the economy as a whole). Panel A reports countries with an increasing relative wage in finance. We add France to this group, which exhibits a similar trend for relative wages in finance after an initial, sharp decline. It is noteworthy that the United States experiences one of the greatest increases in this sample, matched only by the Netherlands. But this trend for a higher relative wage in finance is not shared with all countries, as reported in Panel B. Other countries experience mixed trends in relative wages in finance, most notably the United Kingdom.

Skilled workers are paid more than unskilled workers, so we ask whether different patterns of skill intensities in finance relative to the whole economy—across countries and time—can explain the patterns in Figure 4. Skilled workers are defined consistently in the data as holding at least a college or university degree. We examine the relative skill intensity in finance, defined as the share of skilled workers

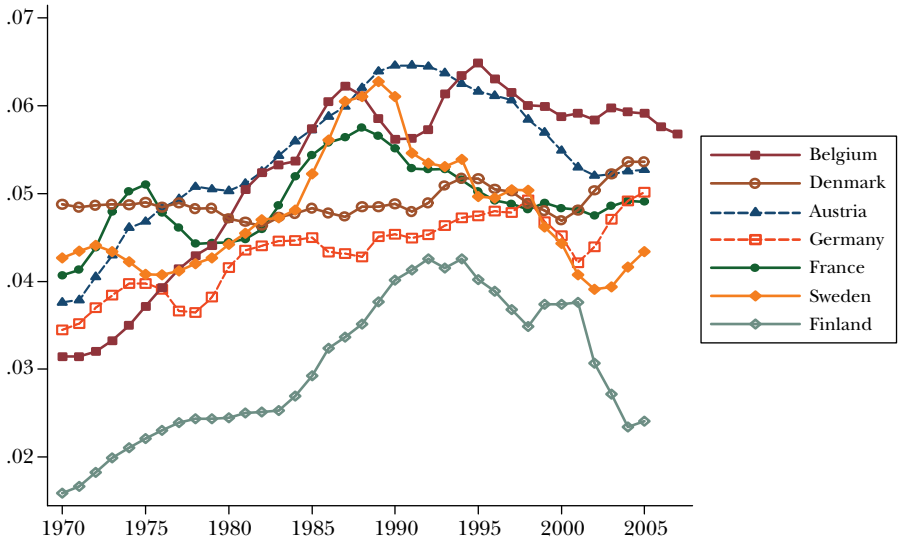
Figure 3

Value Added Shares of Finance in GDP

A: Increasing trend



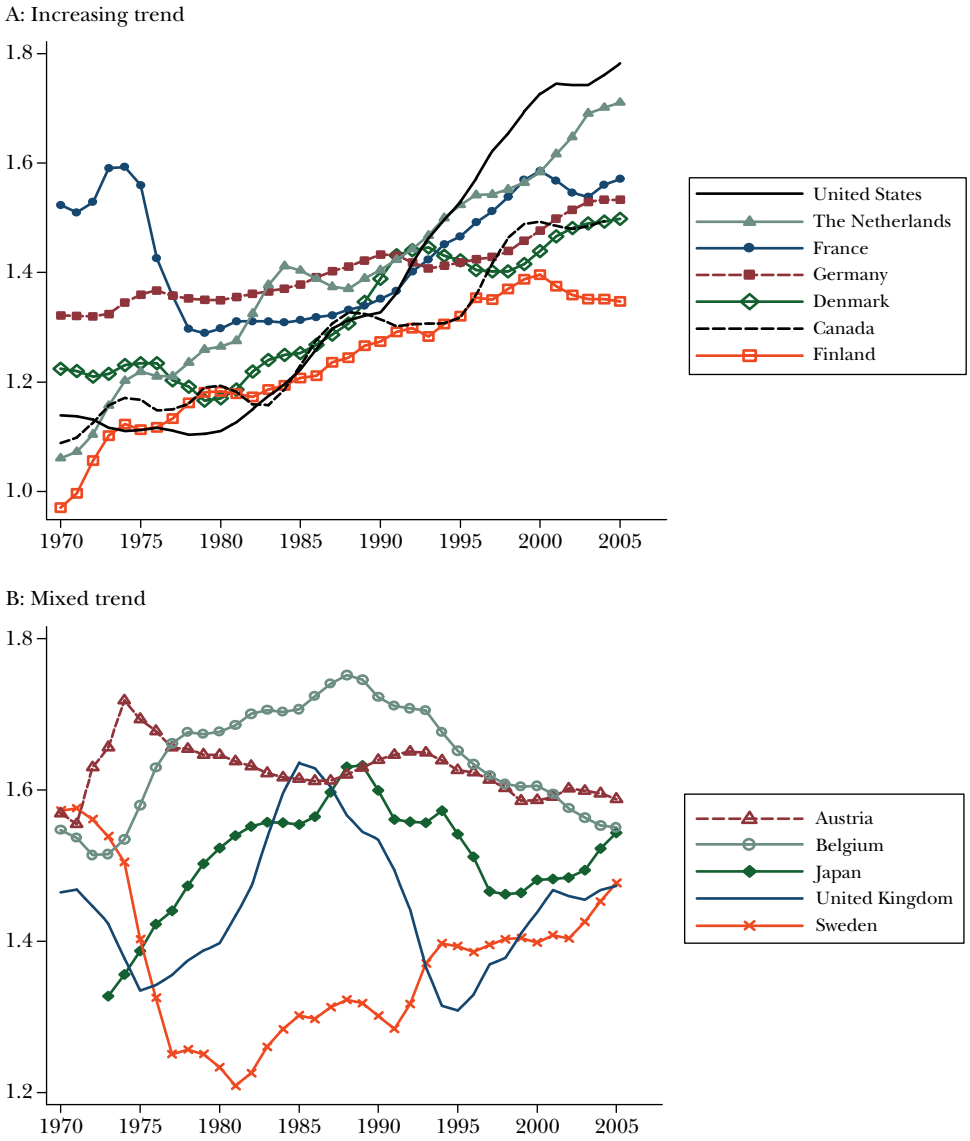
B: Weak increasing or mixed trend



Source: Authors' calculations using data from EU KLEMS.

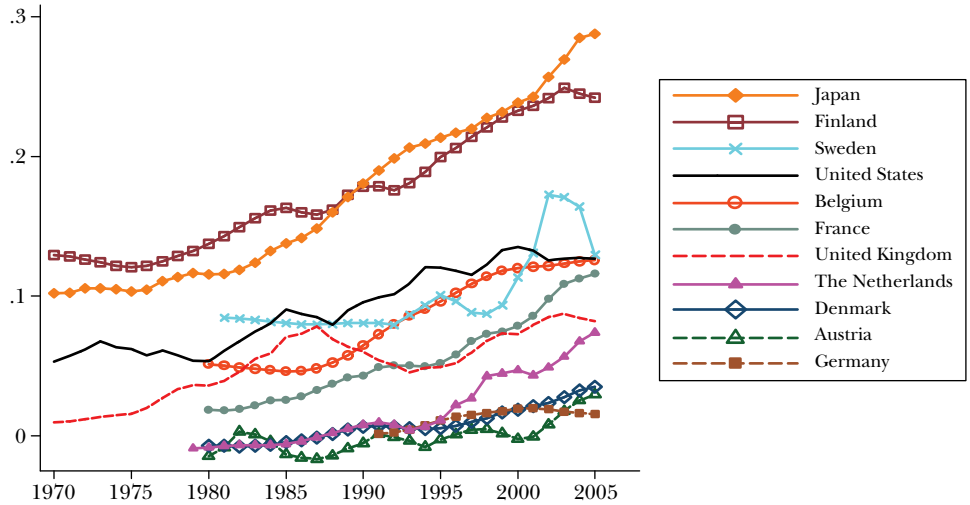
Notes: The figures report the share of finance in GDP. Series are three-year moving averages. Panel A groups countries that exhibit a strong increasing trend. Panel B groups countries that exhibit either a weak upward or mixed trend.

Figure 4
Relative Wage in Finance



Source: Authors' calculations using data from EU KLEMS. Series are three-year moving averages.
Notes: The figures report the average wage in finance relative to the average wage in the whole economy. Average wages are computed by dividing labor compensation by full-time equivalent employment. Panel A groups countries that exhibit an increasing trend (except for France in the beginning of the sample). Panel B groups countries that exhibit either a mixed or decreasing trend.

Figure 5
Relative Skill Intensity in Finance



Source: Authors' calculations using data from EU KLEMS.
Notes: Relative skill is defined as the share of high-skilled workers' (full-time equivalent) employment in finance minus the corresponding share in the whole economy. Skilled workers in all countries are comparable and attain at least a college or university degree. Data for Canada are not available from the EU KLEMS. Series are three-year moving averages.

in employment (measured in terms of full-time equivalent worker) in the financial sector minus the same share in the whole economy. Thus, an upward-sloping line shows that the employment share of skilled workers in finance is rising faster than the overall relative supply of skill.[6]

While the share of jobs held by skilled workers is rising across all economies in our sample (not shown), Figure 5 shows that finance becomes relatively more skill intensive compared to the overall supply of skilled labor in all countries. We also see wide variation in the relative skill intensity in finance, which points to country-specific factors. Within this variation, the United States tends to be higher than most countries—but Finland and Japan exhibit an even higher relative skill intensity in finance. The increase in skill intensity cannot explain finance wages in Figure 4 because relative skill intensity in finance is increasing for all countries in the sample while we see mixed patterns in Figure 4. While skill intensity in the US financial sector increases relative to the whole economy, it does not increase more than the average country. As we show in Philippon and Reshef (2012), faster growth in the cost of skilled labor (returns to skill), together with the increase in relative skill intensity in finance in the United States explains little of the growth of the relative wage in finance.

[6] We obtain a very similar figure when we use the relative wage bill share for skilled workers in finance as an alternative measure of skill intensity.

We also consider wages of skilled workers (defined as above) in finance relative to wages of skilled workers in the whole economy. Panel A of Figure 6 reports countries with consistently increasing relative skilled wages in finance. Panel B exhibits countries with mixed trends. Overall, we see increasing relative skilled wages in finance: skilled workers in finance gain over skilled workers elsewhere in all but two countries, Austria and Belgium, where skilled relative wages in finance are relatively high to begin with and then decline. Once again, the change for the US economy is the largest. Using several methodologies, in Philippon and Reshef (2012) we show that the increase in relative wages in finance is not primarily driven by compositional changes within the group of skilled workers. Given the similarities with Figure 4, differences in skilled relative wages in finance versus the whole economy can help explain at least part of the general rise in overall relative wages in finance. In the next section, we examine two determinants of the increase in relative wages and skill intensities in finance: technology and financial regulation.

Finance Wages and Demand for Skill

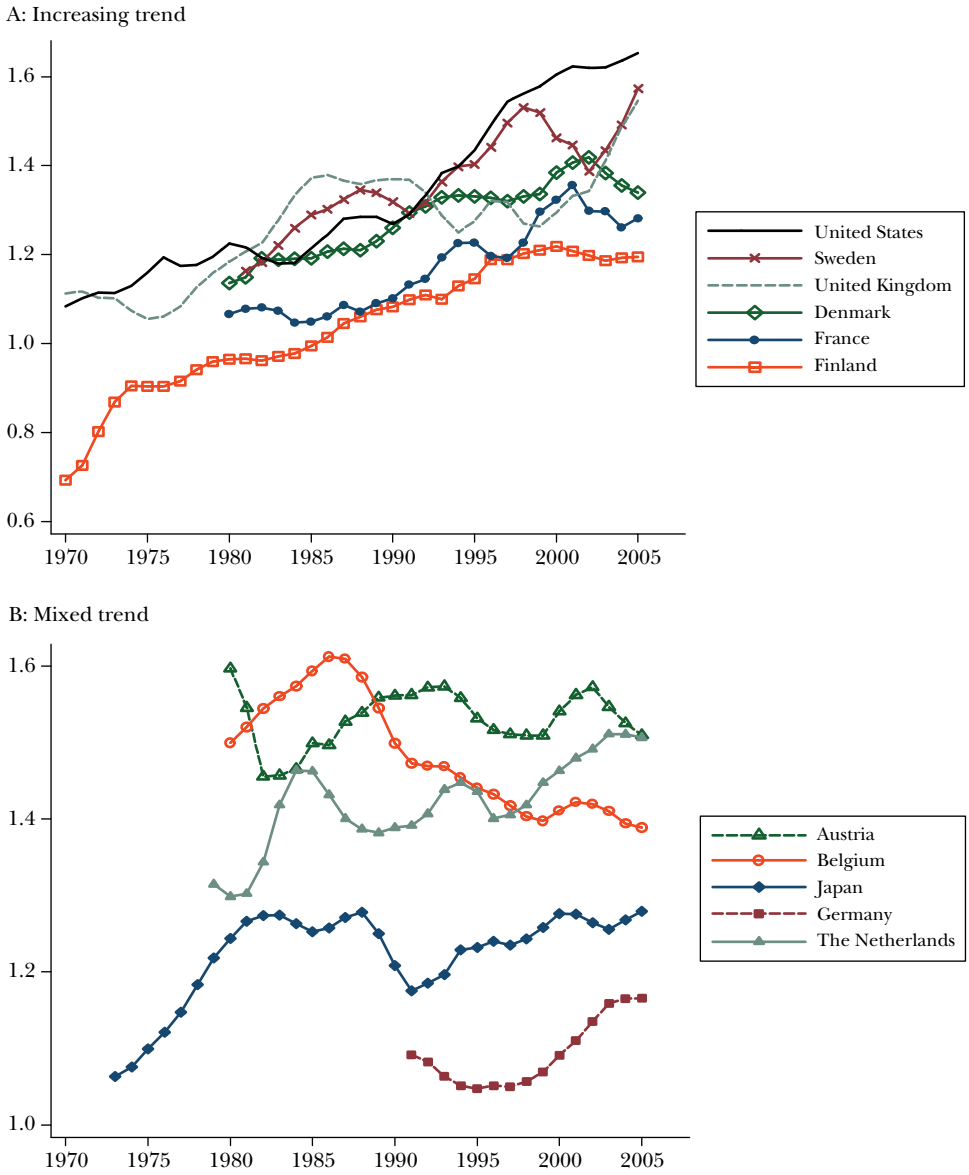
While high wages are now common in finance, this has not always been the case, as can be seen in Figure 4 and Figure 6. In Philippon and Reshef (2012), we document the historical pattern of finance wages relative to the nonfarm private sector over 1909–2006 for several types of workers and comparison groups. We find a U-shape over the sample period for average wages, skilled wages, and executive compensation in finance, using a variety of methods. These findings are in line with Goldin and Katz (2008), who document a large increase in the wage premium for Harvard undergraduates who choose a career in finance since 1970. Kaplan and Rauh (2010) and Bakija, Cole, and Heim (2012) study earnings of individuals with very high incomes, with a particular emphasis on the financial sector. Similarly, finance has become more skill intensive, as documented in Figure 5. Oyer (2008) argues that income differences attract MBAs to finance, rather than consulting or marketing. This change is reflected in the skill intensity of finance.

A long literature points to the fact that information and communication technology increase demand for highly educated workers; for example, see Autor, Katz, and Krueger (1998). And as we argue in Philippon and Reshef (2012), financial deregulation differentially increases demand for skill in finance in the United States. Moreover, these two factors can also affect wages. We examine these hypotheses briefly below in an international context. In ongoing work (Boustanifar, Grant, Philippon, and Reshef 2012), we study systematically several other potential driving factors behind demand for skill and wages in finance. Here we report some preliminary findings.

Financial Regulation

Tight financial regulation limits the range of permissible activities and it forces standard transparent reporting, which in turn restricts the creativity of skilled workers and limits the complexity of their operations. In addition, standardization and

Figure 6
Relative Wage of Skilled Labor in Finance



Source: Authors' calculations using data from EU KLEMS.
Notes: The figures report the average wage of skilled workers in finance relative to the average wage of skilled workers in the whole economy. Average wages are computed by dividing labor compensation by full-time equivalent employment. High-skilled workers in all countries are comparable and attain at least a college or university degree. Data for Canada are not available from EU KLEMS. Panel A groups countries that exhibit an increasing trend. Panel B groups countries that exhibit a mixed trend, or roughly no trend since 1980.

limiting complexity reduces the need to use wage contracts with high-power incentives. Indeed, in Philippon and Reshef (2012), we conclude that financial regulation is the main determinant of both demand for skill and wages in the US financial sector, along with other factors including technology, nonfinancial corporate activity, and financial globalization, which play a secondary role. Does financial deregulation correlate well with wages and demand for skill in our cross-country sample?

To try to answer this question we use data from Abiad, Detragiache, and Tressel (2008), who study financial reform (which is not necessarily deregulation) along seven dimensions in 1973–2005: reduction in credit controls, removal of interest rate controls, removal of entry barriers, privatization, capital account liberalization, securities market development, and introduction of prudential regulation and supervision. These measures do not take into account organizational and activity restrictions that are important for the financial landscape, particularly for the United States: bank branching and separation of investment banking from retail banking. Major changes occurred in these important aspects of the regulatory environment in the United States and are taken into account in the index we constructed in Philippon and Reshef (2012) but not in the Abiad, Detragiache, Tressel (2008) data.

We construct an index of financial deregulation that aggregates seven dimensions of financial reform.[7] A clear pattern emerges. Starting in the 1970s, the level of financial regulation is relatively heterogenous across countries: Austria, Sweden, and France have relatively high levels of financial regulation, while Canada, the Netherlands, and Germany have relatively low levels. However, over time all countries move toward deregulation and generally converge to a more lightly regulated regime.

With some exceptions, countries that deregulate more also experience larger increases in relative skill intensity in finance. The exceptions are Austria and Denmark, which are among the countries that deregulate their financial sector most aggressively but do not experience large increases in relative skill intensity. Other countries line up more closely.

The relationship between deregulation and relative wages in finance is less clear. For example, according to our index, the United States, the Netherlands, and Canada start the sample with relatively light regulation and therefore in the context of this comparison do not deregulate much. But these countries experience larger increases in relative wages in finance, both on average and for skilled workers. Starting from relatively tight regulation, Austria and Belgium deregulate aggressively, but their financial sectors do not exhibit increases in relative wages.[8]

[7] See the online Appendix available with this paper at http://e-jep.org for complete description and Appendix Figure A4 for the evolution of the index for all countries in the sample. A detailed description of the changes in each dimension of financial regulation over the sample are reported in Appendix Table A2.

[8] An alternative source of data on bank regulation is from Barth, Caprio, and Levine (2008), who document a multitude of dimensions of bank regulation in 1999 and 2007. Despite the shorter period and its focus on banking alone, this dataset has invaluable detail on the scope of bank activities and organization of the industry, which is in line with our view on how regulation affects demand for skilled labor and the

Technology

Workers in finance need to collect, process, and analyze information, so it is no surprise that the financial sector was an early adopter of information and communication technology.[9] It is widely accepted that information technology is particularly complementary to complex tasks (more specifically, nonroutine cognitive tasks) and that it substitutes for routine tasks (Autor, Levy, and Murnane 2003). Educated (skilled) workers tend to perform complex tasks, so relative demand for such workers increases with investment in information technology. Moreover, if there is heterogeneity among educated workers in the degree to which they are productive using information and communication technology, we may see skilled wages increase more in industries that invest more in information and communication technology.

We use data on the share of information and communication technology (ICT) capital in total capital compensation from the European Union KLEMS dataset, using constant 1995 prices. This is a measure of the intensity of ICT capital *use*, which takes into account both quantities and prices (rather than quantities alone or value of capital installed). For the United States, we use data from the Bureau of Economic Analysis (Fixed Assets Tables). Data for Canada is not available from the EU KLEMS, so we do not include Canada here.

Figure 7 shows the difference between the intensity of information and communication technology in the financial sector and its intensity in the whole economy. In most countries—with the United States the notable exception—finance has increased its ICT intensity much more than in the whole economy. The surprising result for the United States is driven by the fact that as a whole the United States is among the most intensive economies in using information and communication technology whereas its financial sector is not particularly intensive in its use of information and communication technology relative to financial sectors elsewhere.

Regression Analysis

To what extent can financial deregulation and investment in information and communication technology explain various characteristics of the financial sector in this cross-country data? We expect differential positive effects on demand for skilled workers resulting from complementarity between these two variables. We also expect differential effects on the wages of skilled labor if there is need for higher-quality skilled workers to perform more data analysis and to be more creative.

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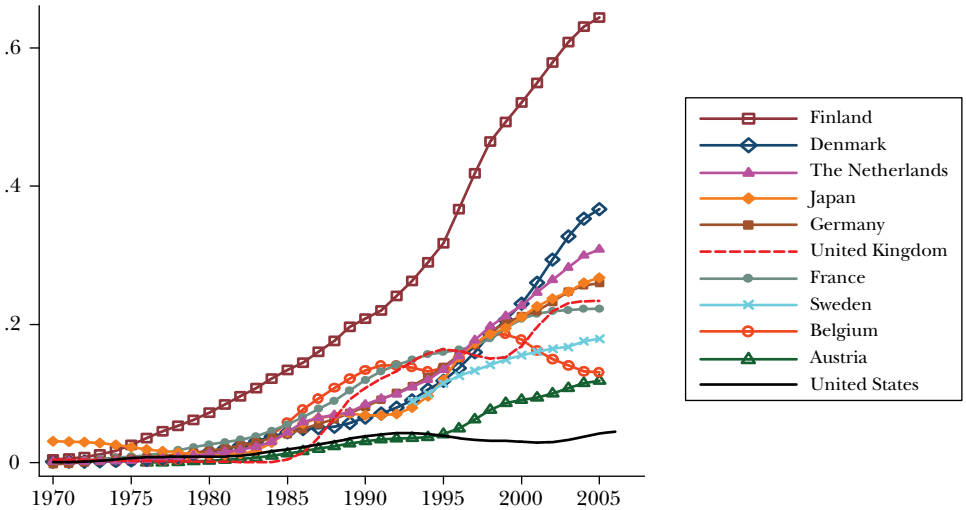
wages they command. Changes in regulation according to this measure are not strongly correlated with changes in regulation in Abiad, Detragiache, and Tressel (2008) in the relevant period. We acknowledge that both of these regulation indices are limited either in scope or in time coverage. Here we only test the explanatory power of financial deregulation based on Abiad, Detragiache, and Tressel (2008) due to its longer sample.

[9] Yates (2000) reports evidence of early information and communication technology adoption during the previous information revolution, starting at the end of the 19th century. Although most of the evidence is for management in manufacturing, some examples exist for insurance.

Figure 7
Relative ICT (Information and Communication Technology) Capital Share in Finance



Source: Authors' calculations using data from EU KLEMS.
Notes: The figure reports the difference between the ICT (information and communication technology) capital share in finance and the ICT share in the whole economy, using constant prices in 1995. Data for Canada are not available from the EU KLEMS. Data for the US are from the Bureau of Economic Analysis, Fixed Assets Tables. Series are three-year moving averages.

Table 1 offers some illustrative regressions. In these regressions, we use three dependent variables: relative skill intensity in finance (see Figure 5); the relative wage of finance (see Figure 4); and the relative wage of skilled labor in finance (see Figure 6). The first variable captures demand for skill, the second overall compensation, while the third captures the differential wages of skilled workers in finance.[10]

All regressions include country fixed effects to account for systematic differences across countries. In even columns, we add year fixed effects to account for common trends. We standardize all the variables in the regressions over the entire sample, so the coefficients can be interpreted as the effect of one standard deviation change in the regressor on the regressand, also in terms of standard deviations (beta coefficients). The regressors are lagged by one year to allow for delayed effects, although results using longer lags or no lags are similar. We drop the United States from these regressions since we find the deregulation index woefully inadequate to describe the changes in regulatory environment in the US economy.

In column 1 in Table 1, we see that relative skill intensity in finance is positively associated with both deregulation and information and communication

[10] See Table A3 in the online Appendix available with this paper at http://e-jep.org for descriptive statistics for all variables.

Table 1
Determinants of Skill Intensity and Wages in Finance

	Dependent variables:					
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	Relative skill intensity		*Relative wage*		*Relative skilled wage*	
Financial deregulation, $t-1$	0.199***	0.123***	0.066	−0.074	0.091**	−0.069
	(0.027)	(0.041)	(0.042)	(0.061)	(0.040)	(0.062)
Relative ICT share, $t-1$	0.301***	0.102**	0.287***	0.268***	0.275***	0.235***
	(0.026)	(0.041)	(0.042)	(0.074)	(0.038)	(0.061)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	Yes	No	Yes	No	Yes
Observations	254	254	297	297	254	254
R^2, within	0.67	0.74	0.27	0.34	0.35	0.47
Number of countries	10	10	10	10	10	10

Source: Authors.
Notes: In these regressions, we use three dependent variables: relative skill intensity in finance; the relative wage of finance; and the relative wage of skilled labor in finance. We standardize all the variables in the regressions over the entire sample, so the coefficients can be interpreted as the effect of one standard deviation change in the regressor on the regressand, also in terms of standard deviations (beta coefficients). The regressors are lagged by one year. We drop the United States from these regressions. ***, and ** indicate levels of significance of 1 percent and 5 percent.

technology; this result is robust to including year fixed effects (column 2). Countries that deregulate more and increase the intensity of investment in information and communication technology see demand for skill rise more than average; this is in line with our results in Philippon and Reshef (2012). The size and statistical significance of the year fixed effects increases over time (not shown), indicating that there is, in addition, a common trend.[11]

We now turn to relative wages. In columns 3 and 4 we see that higher relative wages in finance are associated with information and communications technology, but not with deregulation. Once again, the size and statistical significance of the year fixed effects increase over time (not reported here). Results for relative wages of skilled labor are similar (columns 5 and 6): intensity of information and communications technology is a robust predictor of wages, but deregulation is not. One potential explanation for this is that the measure of deregulation used here does not capture essential dimensions that are important for wages. Another issue is that variation in income taxes influences wages but is omitted from the analysis here.

In all regressions that include year effects, their size and statistical significance increase over time. What may be accounting for the common trends in demand for skill and wages in finance? In Philippon and Reshef (2012), we find that financial

[11] Results using an alternative measure for the demand for skill, namely the wage bill share of skilled workers, are very similar. See Table A4 in the online Appendix available with this paper at http://e-jep.org.

(and trade) globalization does not affect relative skill intensity in finance in the United States. However we do find that it helps explain relative wages and in fact reduces significantly the explanatory power of deregulation in our historical wage regressions. We leave it for future research to determine whether this conjecture holds in the international sample as well. We investigate this point systematically in Boustanifar, Grant, Philippon, and Reshef (2012).

We conclude this section by noting that deregulation and information and communication technology may be associated with the overall relative increase in labor costs in finance, which contributes to the size of the sector, but there is also scope for common global trends that are not country specific.

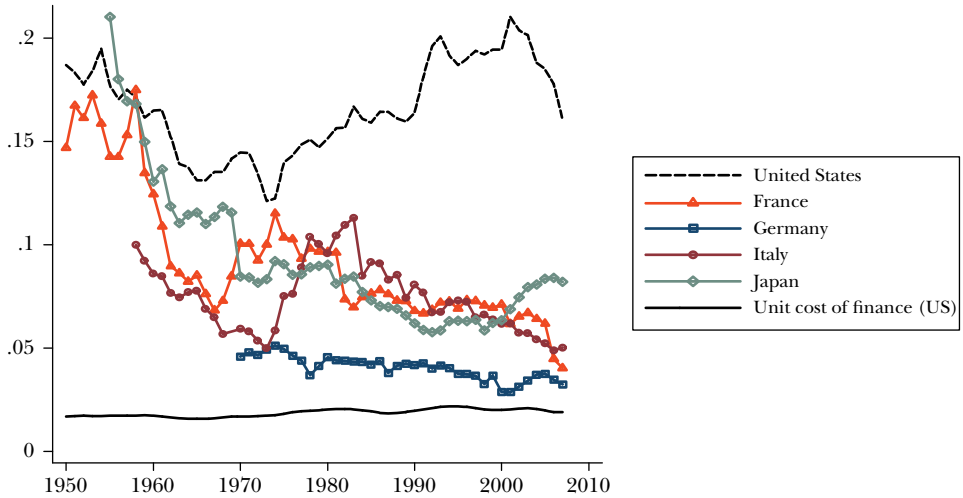
Costs versus Output

Has the rise in financial sector value added in the United States been matched by an increase in the cost per unit of financial services produced? At a conceptual level, this poses the difficult problem of measuring a "unit" of financial services, and adjusting for changes in composition and quality. Philippon (2012) reports a painstaking effort to measure correctly the unit cost of financial intermediation. Executing such a measure for a broad set of countries is a formidable task, which we hope future research will tackle. Here we provide a much cruder measure: We simply divide value added in finance by the outstanding value of bank loans to nonfinancial entities (firms in the private sector, government, and households) from Schularick and Taylor (2012). In addition to the United States, we only do this for four other countries: France, Germany, Italy, and Japan. We restrict attention to these countries because they all have financial sectors that are relatively heavily reliant on banks.

Figure 8 reports the cost ratio of finance value added divided by bank loans, together with the quality-adjusted unit cost measure for the United States from Philippon (2012). The measure of finance value added divided by bank loans is much higher than the unit cost measure. This is a manifestation of the fact that bank loans do not encompass all financial outputs. For the United States, the cost ratio does not trend in the sample, which is consistent with the relatively flat unit cost. For the other countries it falls. We observe qualitatively similar trends when we look at the ratio of value added in banking alone relative to loans (not reported here). Thus, at least using this crude measure, we conclude that the rise of the income share of finance is not driven by an increase in cost per unit of intermediation.

Next, we ask whether changes in the quality of financial services can help explain the recent rise of the income share of finance in the United States relative to other countries. If higher quality comes at a higher cost, then the puzzle is solved. For example, the proliferation of derivatives markets could in theory have benefitted the economy by improving the informativeness of stock prices. But Bai, Philippon, and Savov (2011) find that the predictive power of US stock prices is stable over the last 50 years. And Hadas (2011) argues that commodities' prices have become *less* informative.

Figure 8
Finance Value Added Divided by Bank Loans



Sources: Bank loans are from Schularick and Taylor (2012). Finance value added is from EU KLEMS or STAN (OECD); Italy in 1958–1968 from Istituto Centrale Di Statistica; Japan in 1955–1969 from the Economic and Social Research Institute, Cabinet Office, Government of Japan.
Notes: The figure reports the ratio of finance value added divided by bank loans to nonfinancial entities (firms in the private sector, government and households) for various countries. It also reports "Unit cost of finance (US)," a quality-adjusted unit cost of finance measure for the United States from Philippon (2012).

An alternative approach is to look for signs that, by some measure, US financial markets are performing in a way that allocates capital more effectively. If this comes at a higher cost, then the puzzle is solved. Better-functioning financial markets could in theory help households improve the diversification of their risk, but there is no strong evidence for an increase in consumer risk sharing, let alone evidence that this has happened to a greater extent in the United States. In fact, Aguiar and Bils (2011) show that consumption inequality has closely tracked income inequality over the period 1980–2007. Alternatively, better-functioning financial markets could improve the allocation of capital across firms. This outcome is difficult to measure, but Hsieh and Klenow (2009) look at the dispersion of marginal productivity across US manufacturing firms and estimate the potential gains in total factor productivity from removing allocative inefficiencies in these firms. They find potential gains of 36 percent in 1977, 31 percent in 1987, and 43 percent in 1997. This suggests that the allocation of capital across US manufacturing firms has deteriorated, because the potential gain from removing allocative inefficiencies has increased from 1977 to 1997. Using similar methodology, Osotimehin (2012) finds no trend in potential gains in total factor productivity in French manufacturing over 1991–2006. These findings are at odds with improvements in allocation of capital and risk sharing. However, if there is more innovation in the United States

and more young firms, then intermediation can be more expensive because it is difficult to screen and monitor such firms, as suggested by Philippon (2012) and Laeven, Levine, and Michalopoulos (2012).

Yet another possible explanation for the increase in the cost of financial intermediation is the increased concentration in the US banking sector from 1980 and on. The number of US commercial banks insured by the Federal Deposit Insurance Corporation hovered around 14,000 for most of the twentieth century, but started dropping more-or-less continuously after 1984, until it reached 6,300 in 2011. Similarly, the number of FDIC-insured saving institutions dropped continuously from 3,400 in 1984 to 1,067 in 2011. Commensurately, Haldane (2010) shows that the total assets of top-three US banks as a percent of total commercial banking sector assets shows no trend until 1990, after which it rises from 10 to 40 percent in 2007. Although Haldane (2010) also shows that similar trends prevail in the United Kingdom, it is still possible that market power in the US banking industry has increased more than elsewhere.

Finally, Greenwood and Scharfstein (this issue) provide an interesting analysis by looking into the black box of the finance industry in the United States. They find that much of the growth of finance is accounted for by an increase in investments under active management, which command relatively high—albeit not increasing—fees. This has been driven by an increase in households' participation in the stock market. Greenwood and Scharfstein argue that the growth in active management may benefit households by improving diversification; and that by lowering the cost of capital, this benefits particularly young entrepreneurial firms. But this answer begs the question: Why did active management grow so much in the United States? And has this happened elsewhere? These are interesting questions for future research to answer.

Conclusions

A well-functioning financial sector facilitates information transmission, risk sharing, and allocation of capital, which are key components for the success of capitalist economies. Thus, the rise of the financial sector is sometimes defended by arguing that a more developed financial sector encourages economic growth. Indeed, in broad cross sections of countries, a larger financial sector is positively correlated with economic growth (for example, Rousseau and Sylla 2003; Levine 2005).

But it is quite difficult to make a clear-cut case that at the margin reached in high-income economies, the expanding financial sector increases the rate of economic growth. The long-run patterns of the rise of the financial sector since the nineteenth century, shown in Figure 1, do not have any obvious correlation with trends in growth rates within countries.

Moreover, Figures 1 and 2 demonstrate that the relationship between the size of the financial sector and income is complex, and that most of the rise in living standards from 1870 was obtained with less financial output and a smaller share

of income spent on finance than what is observed after 1980. It also seems that at the current height of development, the relationship between financial output and income per capita may have changed.

There may very well be third factors driving both finance and income: For example, Acemoglu and Robinson (2012) argue that the institutional foundations of prosperity were laid out by the middle of the nineteenth century in many of today's high-income countries (with roots long before that). This type of change can simultaneously cause growth of income, industrialization, and financial development. At a minimum, the secular rise in the financial sector does not seem to deliver *faster* growth. But if finding more growth opportunities becomes ever harder with development, then a larger financial output and a larger share of income may be needed to sustain growth in the sample of now-industrialized countries that we investigate.[12]

Of course, any analysis of the interrelationship between the growth of the financial sector and economic growth in recent decades must also take into account the global recession that began in 2007 and the stagnant growth that has followed. The growth of finance is normally commensurate with growth in credit, but sometimes credit runs out of check. Jordá, Schularick, and Taylor (2011) find that recessions that coincide with excessive credit are deeper and longer, both for normal recessions and financial crisis recessions; and Schularick and Taylor (2012) find that more credit increases the likelihood of a financial crisis. Haldane (2010) estimates the net present value of the most recent crisis between one and five times annual world GDP.

Assessing whether there is "too much" finance—as Arcand, Berkes, and Panizza (2012) and Cecchetti and Kharroubi (2012) argue—must take account of not only diminishing benefits, but also costs, and of counterfactual scenarios in which the growth of finance is inhibited. Whether the social benefits outweigh the costs of the growth of finance is still an open question. Measuring the net social benefits of the growth of finance is a difficult task, which we do not take up here. Instead, this paper discusses some of the determinants of the growth of finance, and asks whether the size of the sector is commensurate with supply of bank credit. While it is difficult to believe that the growth of finance has not come with some benefits—either a wider reach or an increase in quality of services—our findings show that this conclusion is not straightforward, especially for the subset of economies with large and growing financial sectors. Researchers are still in the process of building a model that adequately explains the rise of the financial sector. Based on the time-series and cross-country evidence in this paper, we would argue that any such model needs to fit several facts.

First, the financial sector share of income grows over time. But even within high-income countries, finance reaches very different sizes and represents very different

[12] This idea is akin to Milton Friedman's thermostat analogy (Friedman 2003): Keeping growth constant may require varying degrees of finance, and lately we may be in need of much more of the stuff to keep on at the same growth rate.

shares of the economy. In particular, the US financial sector experiences the largest rise in the share of its financial sector. This phenomenon should be understood separately from the general rise in the share of services across countries.

Second, there is no particular correlation between the size of the financial sector and economic growth in time series data. Moreover, the correlation between financial output and per capita income varies considerably over the last 130 years. While there is a positive relationship between credit and income in the period after 1950, this relationship changes considerably after 1980 when income grows more slowly relative to credit.

Third, wages in finance—average and skilled—have grown relative to wages in the economy as a whole for many countries. Some countries exhibit mixed trends, but in those countries, finance wages are relatively high to begin with.

Fourth, financial services have become relatively more skill-intensive since 1970, and financial deregulation and investment in information and communication technology play a role in explaining this. In addition, there is scope for common global factors, such as increased competition between financial centers to help explain these trends.

Fifth, the rise of finance is not likely to be explained by a rise in the unit cost of financial services.

Our discussion is complementary to Greenwood and Scharfstein's paper in this issue, which provides an illuminating and insightful analysis of the black box of finance. They attribute a sizable portion of the growth of finance in the United States to the increase in active asset management and to an extension of household credit (mostly mortgages). They argue that the growth of active management in the United States is a benefit that came at the cost of management fees; and that the growth of household credit is a benefit that came at the cost of financial stability. These activities are related to higher fees, and are likely related to more skilled labor, which may require higher compensation.

As we build a deeper understanding of what drives growth in the financial sector, both over time within national economies and in cross-country comparisons, we will be in a better position to evaluate in a more rigorous way whether finance is too big, or too expensive, from a social point of view. But the available evidence at present suggests that at the very high end of financial development, rapidly diminishing social returns may have set in.

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