

Financial Liberalization, Capital-skill Complementarity, and Wage Inequality*

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Abstract

Financial liberalization should reduce borrowing constraints and increase capital demand according to theory. If production functions exhibit capital-skill complementarity, liberalization should increase the aggregate demand for skilled labor relative to unskilled labor, increasing wage inequality in equilibrium. This paper studies the effects of financial liberalization on inequality through this theoretical channel. In particular, I test whether financial liberalization increases wage inequality, particularly in industries that are relatively more in need of external finance and have a strong degree of capital-skill complementarity. The test is conducted by studying two episodes of financial liberalization: deregulation of domestic financial markets across a group of countries (mostly European), and bank branch deregulation across U.S. states. I provide evidence that, in both episodes, financial liberalization led to a substantial increase in wage inequality in industries with high financial needs and strong complementarity. I also find that the differential effect on relative wages is particularly strong in economies with rigid labor markets, while the effect on relative labor flows is stronger in economies with flexible labor markets. I calibrate a two-sector general equilibrium model with capital and labor market frictions and analyze the effect of liberalization on aggregate wage inequality. I find that the contribution of financial reform to the rise in aggregate inequality on several countries starting in the 1980s is sizable.

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1 Introduction

Wage inequality, defined as the relative wage between skilled and unskilled labor, increased substantially starting in the 1980s in several OECD countries, such as the U.S., the U.K., and several others. Although the dynamics of wage inequality have been well documented, there is still disagreement about their causes. Several explanations have been proposed, including skill-biased technical change, trade liberalization, and changes in wage setting institutions. However, little attention has been paid to the role of financial markets in this process. An interesting fact is that, at the same time that inequality began to increase, many countries dramatically liberalized their financial markets. Panel (a) of figure 1 shows that, in a cross-section of countries, wage inequality is positively correlated with the state of financial liberalization. Panel (b) of the figure shows a case study, the U.S., where the dynamics of wage inequality closely followed the dynamics of financial liberalization. This evidence suggests that financial liberalization might have been an additional factor contributing to the increase in wage inequality, but more rigorous evidence is needed.¹

[Include figure 1 here]

In this paper, I argue that the liberalization of financial markets has widened the wage gap between skilled and unskilled workers and has therefore contributed to the rise in wage inequality in many developed countries. To identify the causal effect of financial liberalization on inequality, I focus on a theoretical mechanism through which finance affects inequality. According to theory, financial liberalization should improve the efficiency of financial intermediation, alleviating firms' borrowing constraints and increasing capital demand.² If the production functions of firms exhibit capital-skill complementarity –meaning that capital and skilled labor are relative complements (as the evidence indicates)– the demand for skilled labor should increase by more than the demand for unskilled labor. As a result, wage inequality, which is the relative price of skilled labor, will increase in equilibrium.³

¹In this paper, I focus on inequality between skilled and unskilled workers in the non-financial sectors of the economy. For evidence on inequality between workers of the financial and non-financial sectors, see [Philippon and Reshef \(2011\)](#).

²Besides enhancing financial development, financial liberalization can increase financial fragility leading to more frequent crises. In this paper, I only focus on the financial development dimension of liberalization. [Ranciere et al. \(2006\)](#) find that the effect of financial liberalization on growth via financial depth by far outweighs the indirect effect via a higher propensity to crisis.

³This mechanism should be particularly relevant for small and medium-size firms, which are bank dependent and lack good access to capital markets. See [Davis et al. \(1991\)](#) and [Haskel \(1998\)](#) for evidence on the dispersion of skilled/unskilled work and skilled/unskilled wages across small and medium-size firms in the U.S. and the U.K.

Financial liberalization should have particularly large effects when there is a large increase in capital demand and a large increase in the relative demand for skilled labor. Therefore, the effect of liberalization on inequality should be increasing in the extent of financial needs and in the degree of capital-skill complementarity (henceforth CSC). Given that industries are heterogeneous regarding these two dimensions, financial liberalization should have heterogeneous effects on wage inequality across industries. To estimate the causal effect of the reform on inequality, I exploit cross-industry differences in financial needs and CSC.⁴ I estimate the *differential* effect of financial deregulation *across* industries within an economy. The identification assumption is that there aren't other concurrent policies or shocks that increase wage inequality *exclusively* in the subset industries with both high financial needs and strong complementarity.

The contribution of my paper is threefold. First, I provide evidence of a specific mechanism—capital-skill complementarity—by which financial liberalization affects inequality. This contributes to a better understanding of the relationship between finance and inequality, a topic that has been analyzed almost exclusively theoretically. Second, I highlight the role of financial markets in contributing to the rise in wage inequality. This allows for an improved understanding of the determinants of rising inequality in developed countries. Third, I emphasize that capital-skill complementarity varies importantly across industries. This paper provides the first systematic ranking of the complementarity between capital and skills across industries.

To estimate the effect of finance on inequality, I focus on two different episodes of financial liberalization. The first episode of reforms refers to the deregulation of domestic financial markets across a large group of countries (mostly from Europe). Starting in the 1970s, these countries moved from government control toward greater private provision of financial services under fewer operational restrictions. The second episode consists of the removal of geographic restrictions on banking across individual states of the U.S. From the 1970s through the 1990s, most states allowed banks to branch within and across state borders. Focusing on two completely independent sets of reforms increases the external validity of my results.

I identify an industry's intrinsic degree of financial needs by using the widely-used index of external financial dependence developed by [Rajan and Zingales \(1998\)](#). The index is defined as the difference between investments and cash generated from operations for the median firm in each industry. To identify an industry's inherent degree of CSC, I use a panel of countries across time and estimate a skilled labor share equation for each industry. From each estimation, I recover the elasticity of the share of skilled labor over the wage bill to capital intensity and

⁴I document that financial needs and CSC are uncorrelated across industries. As a result, there are industries in each of the four possible combinations (high and low) of financial needs and complementarity.

use it as a proxy for that industry's degree of CSC.

The comparison of wage inequality across industries makes sense only if the economy exhibits labor market frictions that prevent labor from moving freely across industries; otherwise, relative wages would be identical in all industries. According to theory, in economies with rigid labor markets, the bulk of the adjustment of an industry labor market to a financial reform comes through relative wages. On the other hand, the adjustment with flexible labor markets comes primarily through relative labor flows. I rank countries and states according to their degree of labor rigidity and analyze how the effect of liberalization on inequality varies with different labor market institutions.⁵

I first find that financial liberalization increased capital demand particularly in industries that are heavily dependent on external finance. Next, I find that liberalization increased wage inequality disproportionately in industries with greater needs for external finance and strong CSC. The result holds for both episodes of reforms. The economic magnitude of the effect is considerable. In the country-level analysis, wage inequality in industries with high financial needs and strong complementarity increased by roughly 3% more than in the rest of the industries, which accounts for 43% of the country-level variation of inequality. In the state-level analysis, the differential effect on wage inequality across industries is 1%, explaining 10% of the state-level variation of inequality.

I also find that relative labor flows do not respond to financial liberalization in the country-level analysis, while they respond strongly in the state-level analysis. This finding is consistent with the fact that labor markets are more rigid in Europe than in the U.S. To analyze this systematically, I exploit labor rigidity across countries and states. I find that the effect of liberalization on inequality across industries is higher in countries and states with more labor market regulations, while the effect on relative labor flows across industries is higher in economies with more flexible labor markets. This evidence further supports the theoretical mechanism between finance and inequality highlighted in this paper.

While the reduced form analysis has the benefit of achieving a clean identification of the effect of liberalization on inequality, it only allows to estimate the *differential* effect across industries. To analyze the effect on *aggregate* inequality, I simulate a financial reform using a two-sector general equilibrium model. The industries in the model are heterogenous regarding financial needs and CSC. The economy exhibits frictions in both the capital and the labor

⁵Given that labor is able to move across industries in the very long run, the time horizon for the analysis of the differential effect across industries is short to medium run. Nevertheless, the overall effect on aggregate inequality should persist in the long run.

market market. I calibrate the model in order to match the theoretical prediction regarding the differential effect of inequality with the results obtained in the reduced form analysis.

I find that the effect on aggregate wage inequality is sizable. For example, liberalization explains 20% of the increase in aggregate inequality in the U.K. during the 1980-2000 period. Likewise, bank deregulation explains 13% of the rise in U.S. inequality during the same time period. Finally, according to the simulation, financial liberalization leads to an increase in the *level* of wages of both types of labor.

The remainder of this paper proceeds as follows. In the next section, I relate the paper to the existing literature. In section 3, I outline the theoretical framework and present the testable predictions of the model. In section 4, I describe the empirical strategy. In section 5, I describe the reforms and the data used. In section 6, I present the main reduced form results. In section 7, I report additional empirical results. In section 8, I conduct the structural analysis. In the final section, I present concluding remarks.

2 Related literature

This paper is related to several strands of the literature. First, it contributes to the recent literature on financial deregulation and inequality. [Beck et al. \(2010\)](#) and [Jerzmanowski and Nabar \(2011\)](#) use different methodologies to analyze the effect of branch deregulation on inequality in the U.S. While the former paper finds that deregulation decreased wage inequality, the latter finds the opposite result. While they both identify the effect by exploiting differences in timing of deregulation across states, I exploit differences in external finance and CSC across industries within a state (or country). Documenting evidence of a specific mechanism by which finance affects inequality provides a stronger test of causality. In addition, besides analyzing deregulation across states in the U.S., I analyze deregulation across a large group of countries. My paper also connects to the work of [Philippon and Reshef \(2011\)](#). While they analyze the effect of U.S. deregulation on the wage gap between employees in the financial and real sectors, I analyze the effect on the wage gap between employees with college and non-college degrees within the real sectors of the economy.

Second, this paper is also related to the recent literature on finance and labor, which argues that financial market imperfections can have significant impact on employment decisions of firms. [Benmelech et al. \(2011\)](#) show that financial constraints and the availability of credit play an important role in firm-level employment decisions. [Pagano and Pica \(2011\)](#) show that financial development is associated with greater employment growth, particularly in countries

with less developed financial markets. I contribute to this literature by arguing that improvements in financial markets affect different margins of industry-level labor markets. I argue that the relative importance of these margins depends on the labor market rigidity of the economy.

This paper adds to a growing literature studying the real effects of financial liberalization. There are several papers that have studied the effects of liberalization on economic growth using international inter-industry data (Galindo et al., 2002; Gupta and Yuan, 2009; Levchenko et al., 2009). These papers identify the effect of the reform by exploiting cross-industry differences in the need for external finance. More related to my work is Chari et al. (2009), who show that average wages increase after capital market integration. However, there is no international industry-level evidence regarding the effects of financial reform on wage inequality. My paper provides the first attempt to fill this gap.

This paper in addition relates to the extensive literature on the determinants of rising wage inequality. Several explanations have been proposed to explain the shift of demand against unskilled workers. In particular: skill biased technical change (Katz and Murphy, 1992), trade liberalization (Wood, 1995), and changes in labor market institutions (DiNardo et al., 1996). My paper contributes to this line of work by highlighting the role of financial liberalization as an additional factor contributing to the increase in inequality.

Finally, this paper contributes to the literature studying the relationship between CSC and inequality. Griliches (1969) was the first to provide evidence that capital and skilled labor are more complementary as inputs than are capital and unskilled labor, the “capital-skill complementarity hypothesis”. Krusell et al. (2000) show that with CSC, the rise in the stock of capital equipment can account for most of the increase in wage inequality in the last decades in the U.S. While these authors focus on technological change as the driving force behind the capital stock increase, I focus on financial liberalization. As explained above, I also contribute to the study of CSC by arguing and documenting that the degree of complementarity between capital and skilled labor varies substantially across industries.

3 The model

3.1 Environment

Consider an economy that produces two goods (1 and 2) using three productive factors: capital (k), skilled labor (s), and unskilled labor (u). There are three types of agents in the economy: firms, skilled workers, and unskilled workers. All workers supply inelastically one unit of labor. The aggregate supplies of skilled and unskilled labor are S and U . The skilled and

unskilled wage rates are denoted by w_s and w_u . Firms in both industries have the same capital endowment, equal to A . The economy is small and open and takes the relative price of goods (p_1/p_2) and the rental rate of capital (r) as given.⁶

Production functions in both industries exhibit constant returns to scale and are strictly quasi-concave:

$$y_i = f_i(k_i, s_i, u_i) \quad \text{for } i \in \{1, 2\}$$

The elasticities of substitution between capital and skilled labor and capital and unskilled labor in industry i are denoted by σ_i^{ks} and σ_i^{ku} . Industry i is said to exhibit CSC if $\sigma_i^{ku} > \sigma_i^{ks}$. It is useful to note that $f_i(\cdot)$ exhibits CSC if and only if $\frac{\partial(f_s/f_u)}{\partial k} > 0$. Intuitively, when the production function exhibits CSC, an increase in the capital stock increases the marginal product of skilled labor by more than the marginal product of unskilled labor.

Assumption 1. *Capital complements skilled labor more strongly in industry 1 than in industry 2, i.e.:*

$$\frac{\sigma_1^{ku}}{\sigma_1^{ks}} > \frac{\sigma_2^{ku}}{\sigma_2^{ks}}$$

3.2 Markets

Capital market. The capital rental market in the economy is imperfect. There is a financial friction that has an asymmetric effect across industries. Firms in each industry can borrow (b) only a multiple $\theta - 1$ of their capital endowment at the international rental rate:

$$b_i \leq (\theta_i - 1)A \quad \text{with } \theta_i \geq 1 \tag{1}$$

The multiple θ_i is separated into two components, $\theta_i = \theta + \epsilon_i$. The parameter θ captures the degree of financial repression in the economy. The parameter ϵ_i measures the asymmetry of the financial friction across industries.

Assumption 2. *The financial friction is more binding in industry 1 than in industry 2, i.e.:*

$$\epsilon_1 < \epsilon_2$$

⁶Alternatively, I could assume that capital is supplied inelastically in the context of a dynamic economy. A financial reform would lead only to reallocation of capital across industries. However, since wages increase, there are more savings, which increase the capital stock of the next period. I could therefore compare the steady states of the economy before and after the reform.

This formulation of the capital market imperfection is analytically convenient. The parameter θ captures the degree of financial repression of the economy.⁷ By varying it, I can trace out all degrees of capital market efficiency. $\theta \rightarrow \infty$ corresponds to a perfect capital market while $\theta = 1 - \epsilon_i$ means that the capital market is completely shut down. I assume that θ is low enough so that the constraint (1) binds in both industries.

Finally, I make the assumption that industry 2 has both low financial needs and low complementarity, relative to industry 1, just for simplicity. The result that financial liberalization increases wage inequality more in industry 1 than in industry 2 would still hold had I assumed that industry 2 has high financial needs and weak complementarity or low financial needs and strong complementarity.

Labor market. In order to introduce wage inequality differentials across industries, I assume that there are labor market regulations that prevent labor from freely moving across industries. Given that labor regulations are more binding for unskilled workers, for simplicity I assume that, while skilled labor can freely move across industries, unskilled labor can move only imperfectly.⁸ This means that $w_{s1} = w_{s2}$ and $w_{u1} \neq w_{u2}$. Wage inequality in industry i is defined as:

$$\omega_i = \frac{w_s}{w_{ui}}$$

As a result of the labor friction, in general $\omega_1 \neq \omega_2$. To simplify the analysis, I assume that the elasticity of unskilled labor mobility is constant (Casas, 1984):

$$\frac{u_1}{u_2} = \left(\frac{w_{u1}}{w_{u2}} \right)^\psi, \quad (2)$$

where $\psi \geq 0$ denotes the elasticity of unskilled labor mobility and represents the degree of labor market rigidity in the economy.⁹ This specification allows for a flexible modeling of imperfect mobility, spanning economies where unskilled labor is completely immobile ($\psi = 0$) to economies where it's perfectly mobile ($\psi \rightarrow \infty$).

Finally, labor markets within an industry are competitive. This means that the marginal product of each type of labor is equalized to its respective wage in each industry.

⁷The constraint (1) can be microfounded by introducing an asymmetric information problem in the model.

⁸Assuming that skilled labor is just as immobile as unskilled labor would not alter the predictions of the model. I only require that *relative* labor be imperfectly mobile.

⁹Rigidity in the model should be interpreted broadly, representing labor frictions such as hiring costs and unions.

3.3 Optimal behavior and equilibrium

Given that constraint (1) binds in both industries, capital demand in each industry will be proportional to the capital endowment:

$$k_i = b_i + A = \theta_i A \quad (3)$$

Skilled and unskilled labor in each industry will be demanded until the point where the marginal product of labor equals the relevant wage rate:

$$\begin{aligned} \frac{\partial f_i(\cdot)}{\partial s} &= \frac{w_s}{p_i} \\ \frac{\partial f_i(\cdot)}{\partial u} &= \frac{w_{ui}}{p_i} \end{aligned} \quad (4)$$

The flexibility of wage rates ensures that total labor demand equals the supply of each type of labor:

$$\begin{aligned} s_1 + s_2 &= S \\ u_1 + u_2 &= U \end{aligned} \quad (5)$$

Finally, since the production functions exhibit constant returns to scale, the payment to all factors must equal the value of production in each industry:

$$k_i r_i + s_i w_s + u_i w_{ui} = p_i y_i, \quad (6)$$

where $r_i = r + \lambda_i$ denotes the marginal product of capital in each industry. The variable λ_i is the Lagrange multiplier corresponding to the borrowing constraint.

As shown in Appendix A, equations (2) to (6) can be log-linearized to yield a closed-form solution for the percentage change of wage inequality across industries.

3.4 Financial liberalization

Now, suppose that the government undertakes financial liberalization with the ultimate goal of fostering credit markets. A reform in the model consists of an increase in the parameter θ , which makes the borrowing constraint (1) less binding. The underlying logic is that financial liberalization improves the efficiency of financial intermediation, which improves banks' ability of screening and monitoring loans. The effects of financial liberalization are outlined below (all proofs can be found in Appendix A).

Proposition 1. *Capital demand in industry 1 increases more than in industry 2, $\frac{\partial(\widehat{k_1/k_2})}{\partial\theta} > 0$.*

Financial liberalization alleviates the borrowing constraint in the economy. Since the borrowing constraint in industry 1 is more binding than in industry 2, industry 1 will benefit relative more from the reform. As a result, capital demand will increase relatively more in industry 1.

Proposition 2. *Wage inequality in industry 1 increases more than in industry 2, $\frac{\partial(\widehat{\omega_1/\omega_2})}{\partial\theta} > 0$.*

The increase in capital demand in both industries is accompanied by an increase in the demand for both skilled and unskilled labor. Since the production functions exhibits CSC, the relative demand for skilled labor increases, leading to an increase in the relative wage of skilled labor. Given that borrowing constraints and CSC are stronger in industry 1 than in industry 2, wage inequality will increase relatively more in industry 1. This will produce an instantaneous outflow of relative skilled labor from industry 2 towards industry 1, in search for the higher returns to skill. However, given that labor is not perfectly mobile, the movement will be less than that required to equalize relative wages across industries. As a result, wage inequality will increase by more in industry 1 than in industry 2.

Proposition 3. *The differential effect of wage inequality across industries is decreasing in the degree of labor market flexibility, $\frac{\partial^2(\widehat{\omega_1/\omega_2})}{\partial\theta\partial\psi} < 0$.*

As explained above, after a reform relative labor flows from industry 2 towards industry 1. The more it can flow, the larger the adjustment of labor, and thus the lower the differential change of relative wages across industries. If unskilled labor were fully mobile, then relative labor would flow until wage inequality in both industries is equalized. As a result, the reform would increase wage inequality in both industries by the same rate. If, at the other extreme, unskilled labor were fully immobile, the differential change of inequality across industries would be maximized. In other words, the higher the degree of labor rigidity, the more inelastic the relative labor supply of each industry. As a result, the increase in relative labor demand would be reflected primarily through an increase in relative wages, not in relative quantities.

4 Empirical strategy

According to the model, financial liberalization should increase wage inequality disproportionately in industries with high financial needs and strong CSC. Based on this prediction, my

identification strategy for estimating the causal impact of the policy on inequality will consist of exploiting cross-industry differences in both financial needs and CSC.

4.1 Identification

There are at least two potential threats to identification. First, there could be other policies or reforms that take place at the same time than financial liberalization and could also increase inequality (e.g. trade openness or skilled biased technological change). Secondly, the decision to deregulate could be endogenous and be triggered by a third factor that could also increase inequality (e.g. banking crisis).

My strategy of exploiting heterogeneity across industries should deal with these threats for the following reason. The model provides a very specific prediction regarding the cross-industry effects of financial liberalization: the subset of industries with high financial needs and strong complementarity should be the most affected by the policy. It is very hard to come up with a reasonable alternative story of another shock that delivers the exact same cross-industry prediction. In other words, I don't disagree that there could be other policies or shocks that could be concurrent to financial liberalization or that could trigger the decision to deregulate. Neither do I disagree that the effects of these other factors could be heterogeneous across industries. The identification assumption is that these factors do not increase inequality *exclusively* in the subset of industries with both high financial needs and strong complementarity. I will go back to this topic in further detail in subsection 7.4. I now rank industries regarding the two cross-sectoral characteristics.

4.2 External financial dependence

I identify an industry's intrinsic degree of financial needs with the widely-used index of external financial dependence developed by Rajan and Zingales (1998). The index is defined as the fraction of capital expenditures not financed by cash flow from operations for the median publicly traded firm in each industry in the U.S., $EFD_i = \frac{(CAPX - CF)_i}{CF_i}$. The logic behind the index is that, for technological reasons, some industries need more external financing than others. For instance, industries that operate on large scales, with long gestation periods, high R&D, or high working capital needs tend to have relatively high financial needs.

The assumption made is that the use of finance by publicly traded firms in the U.S. allows to observe their demand for external funds. These firms are large and well established, with far better access to well-developed capital markets than small firms within the U.S. or across

the world. Hence, the financial dependence index should provide a clean measure of the demand for external finance, not influenced by constraints on the supply side. Assuming that these technological differences persist across economies, I can use the external dependence of industries in the U.S. to rank industries in every economy along this dimension.¹⁰

4.3 Capital-skill complementarity

Since different industries have different production functions, capital and skilled labor should have a stronger degree of complementarity in some industries than others. Capital will tend to strongly substitute for unskilled workers in industries where the latter carry out a very limited and well-defined set of cognitive and manual activities, which can be accomplished by following explicit rules (routine tasks). Likewise, capital will tend to strongly complement skilled workers in industries where the latter carry out problem-solving and complex communication activities (non-routine tasks).

In order to construct a CSC index, I estimate a skilled labor share equation for each industry.¹¹ Following [Berman et al. \(1994\)](#), I assume that capital is a quasi-fixed factor and that skilled and unskilled labor are variable factors. I approximate the variable cost function to a Translog function. As shown in Appendix A, cost minimization under constant returns to scale yields the following share equation for each industry:

$$\mathcal{S} = \alpha + \gamma \log(\omega) + \gamma \log(k/y), \quad (7)$$

where \mathcal{S} denotes the share of skilled labor payment in the wage bill, i.e. $\mathcal{S} = \frac{w_s s}{w_s s + w_u u}$. A positive coefficient for γ in equation (7) implies capital-skill complementarity. Intuitively, when capital and skilled labor are relative complements, an increase in capital intensity leads to an increase in the relative demand for skilled labor, causing the wage bill share of skilled workers to increase. The stronger the complementarity between capital and skilled labor, the larger the increase in the skilled labor share. I therefore use the γ coefficient as a measure of industry-level CSC.

I use data from a panel of countries across time and estimate the following equation for each industry:

$$\mathcal{S}_{ct} = \alpha + \beta \log(\omega)_{ct} + \gamma \log(k/y)_{ct} + \eta_c + \eta_t + \varepsilon_{ct}, \quad (8)$$

¹⁰[Rajan and Zingales \(1998\)](#) compute the index only for manufacturing industries. I extend the index to cover non-manufacturing industries as well.

¹¹Another alternative is to directly estimate production functions for each industry and then recover the different elasticities of substitution. The problem with this approach is that the precision of non-linear estimation of elasticities of substitution has been proven to be low, since it is hard to adequately capture the variation in the curvature of production functions ([Duffy et al., 2004](#)).

where c indicates the country, t the year, and η_c and η_t are country and year fixed effects. I estimate this equation separately for each industry and recover the parameter γ from each estimation. I define the capital-skill complementarity index of industry i as $CSC_i = \gamma_i$.

To estimate equation (8), I must take into account that the variation in $\log(k/y)$ might not be completely exogenous. For example, a skill-biased technological shock can increase both capital intensity and the relative demand for skilled labor, and hence the wage share of skilled labor. To obtain an exogenous variation of capital intensity, I use lagged values of the dependent and independent variables as internal instruments.¹² I estimate equation (8) in first differences:

$$\Delta \mathcal{S}_{ct} = \beta \Delta \log(\omega)_{ct} + \gamma \Delta \log(k/y)_{ct} + \Delta \eta_t + \Delta \varepsilon_{ct}, \quad (9)$$

where Δ denotes the time difference operator, i.e. $\Delta x = x_t - x_{t-1}$. The identification assumption to estimate the first-differences equation is that the error term in equation (8) is not serially correlated and that the explanatory variables are weakly exogenous (i.e., uncorrelated with future realizations of the error term). In other words, the exclusion restriction states that lagged values of capital intensity affect the wage share of skilled labor only through its effect via current capital intensity. The GMM panel estimator uses the following moment conditions to estimate the complementarity coefficient: $\mathbb{E}[z_{ct-j} \cdot \Delta \varepsilon_{ct}] = 0$ for $j \geq 2, t \geq 3$, where $z = [\mathcal{S}, \log(\omega), \log(k/y)]$.

5 Data

5.1 Financial liberalization

Country-level reforms. In the last quarter of the twentieth century, financial markets across the world moved from government ownership or control towards greater private provision of financial services under fewer operational restrictions. [Abiad and Mody \(2005\)](#) document that in many cases financial reforms were triggered by shocks such as a balance-of-payments crises, which destabilized cooperation among different interest groups. Other shocks that precipitated reform were falling global interest rates and participation in IMF programs. The overall trend towards liberalization also reflected pressures generated by the need to catch up with regional reform leaders.

The data on financial liberalization used in this paper comes from [Abiad et al. \(2010\)](#). The authors create a liberalization index that runs from 1975 to 2005 and measures the re-

¹²The GMM-IV procedure with internal instruments was first introduced by [Arellano and Bond \(1991\)](#).

removal of government control of the financial sector. Recognizing the multifaceted nature of financial liberalization, the index is an aggregation along seven dimensions: credit controls, interest rate controls, bank entry barriers, restrictive regulations, bank privatization, controls on international financial transactions, and securities market policy.

After intersecting the [Abiad et al. \(2010\)](#) reform data with the EU-KLEMS dataset on wage inequality, which will be explained below, I obtain a sample of 20 countries. By the nature of the EU-KLEMS dataset, the majority of the countries are European. All data details are provided in Appendix B.

To obtain precise liberalization dates, I set a threshold for the [Abiad et al. \(2010\)](#) index, above which a country is considered liberalized. Following the work of previous studies ([Braun and Raddatz, 2007](#)), the reform variable is defined to take the value of one when the country's normalized liberalization index is above the median of the index across all countries (which corresponds to the value of 0.7) and the value of zero when the index is less than or equal to the median.¹³ Appendix B reports the dates of liberalization according to this classification. As can be seen, there are important differences in the timing of the reforms. The countries that first started liberalizing their financial markets (late 1970s) were Germany and the U.K. Eastern European countries were the last to undertake reform (late 1990s).

State-level reforms. For most of the last century, states in the U.S. imposed various restrictions on the ability of banks to branch within state borders and to operate in other states. Starting from 1970, several states relaxed these restrictions, allowing bank holding companies to consolidate bank subsidiaries into branches and permitting de novo branching statewide. This relaxation came gradually, with the last states lifting restrictions following the 1994 passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act.

[Kroszner and Strahan \(1999\)](#) have argued that small banks fought to maintain branching restrictions, since these restrictions protected them from larger and more efficient banking organizations. Technological innovations, such as the invention of the ATM and the reduction in transportation and communication costs, allowed firms to by-pass local banks, reducing the value to the protected banks of geographical restrictions. These technological innovations interacted with preexisting state-specific differences in the power of local banks to shape the timing of deregulation across states.

I set the date of deregulation as the date in which a state permitted branching via merg-

¹³I tried different threshold values for the index, between 0.6 and 0.8, and the results remain unchanged. All results presented are robust to using the original [Abiad et al. \(2010\)](#) reform index, which is continuous.

ers and acquisitions through the holding company structure, which was the first step in the deregulation process. Appendix B reports the dates of intra-state branch deregulation. As can be seen, 15 states deregulated before the start of my sample period. Arkansas, Iowa, and Minnesota were the last states to deregulate.

5.2 Wage inequality data

Country-level data. The data on wage inequality comes from the EU-KLEMS dataset, a statistical and analytical research project financed by the European Commission. It provides industry-level information for a group of European countries, plus a few non-European ones, on capital, labor by skill level, and labor compensation by skill level. It is a panel spanning the 1970-2005 period. Fourteen countries in the database have information on capital, labor, and compensation by skill level, and thus can be included in the estimations of the skilled labor share equations. The 20 countries listed in the previous subsection have data on labor compensation by skill level and can be included in the estimation of the effect of financial liberalization on inequality. Finally, there are 15 two-digit ISIC Rev. 3 industries providing capital and labor compensation data, for which a skilled labor share equation can be estimated. The data includes both manufacturing and non-manufacturing industries. I exclude the financial services industry to focus only on the real sectors of the economy.

EU-KLEMS provides industry information on wages total hours worked by skill level (high, medium, and low). I define skilled labor as the labor force with some tertiary education (high skill level) and unskilled labor as the labor force with less than tertiary education (medium and low skill levels).

State-level data. I use the Merged Outgoing Rotation Groups (MORG) files of the Current Population Surveys (CPS) to obtain wage inequality data. The CPS is a monthly household survey conducted by the Bureau of Labor Statistics to measure labor force participation and employment, where 60,000 households per month across the U.S. are queried.

The sample period under study is 1979-2002. I include all wage workers with ages from 25 to 64. I use a consistent variable for years of education and assign workers a consistent CIC industry code using the concordance tables provided by [Autor et al. \(1998\)](#). Hourly wages are defined as reported hourly earnings for those paid by the hour and usual weekly earnings divided by hours worked last week for non-hourly workers. I define skilled workers as those with 13 or more years of completed education and unskilled workers as those with 12 or fewer years of education. All results are robust to dropping the top 1%, 5%, and 10% wage earners

within the high-skill group. I aggregate the wages of all workers to a state×industry×year cell by using an earnings weight that is equal to the product of the CPS sampling weight and hours worked in the prior week.

5.3 Financial dependence and complementarity indices

External financial dependence. The index is constructed using data from COMPUSTAT. Both capital expenditures and cash flow are summed up over the relevant time period (1975-2005) to compute the firm-level external financial measure. The industry-level index is then defined as the external financial dependence of the median firm for each industry.

Column (1) of table 1 depicts the external financial dependence measure for the 15 industries in the sample. As can be seen, there is substantial cross-industry variation in the index. The chemicals manufacturing industry presents the highest needs for external finance, while the wholesale trade industry presents the lowest financial needs.

[Include table 1 here]

Capital-skill complementary. Column (2) of table 1 reports the CSC index for each industry, together with its 95% confidence interval. CSC is statistically different from zero in all but one industry (hotels and restaurants).¹⁴ Capital and skilled labor are relative complements in all industries except retail trade, which is consistent with the evidence of CSC at the aggregate level (Duffy et al., 2004). All manufacturing industries exhibit CSC, which is consistent with the fact that, on average, low-skilled workers are more easily substituted by capital in manufacturing than in services, since these workers conduct more routine tasks. The industry with strongest CSC is post and telecommunications. This finding is compatible with the fact that telecommunications is an industry highly intensive in skilled labor, where computer capital strongly complements skilled workers in carrying out non-routine tasks.

It is interesting to note that the EFD and CSC indices are statistically uncorrelated. The third column of table 1 shows the product between both indices. Industries with high values of this product (e.g. manufacturing of chemicals and post and telecommunications) should be affected disproportionately by financial liberalization.

Stability of indices. Finally, I calculated the EFD and CSC indices for different time periods and the resulting ranking of industries remain unchanged. The ranking also remain unchanged

¹⁴For the majority of the estimations, I cannot reject the null hypothesis of no second-order serial correlation of the differenced residual (and hence no first-order serial correlation of the original residual), which validates the instruments used.

if I estimate the indices with only pre-reform data. These findings support the assumption that the two industry characteristics are technologically determined and are therefore not affected by the reforms.

6 Reduced form results

6.1 Country-level results

I start by analyzing the effect of country-level financial liberalization on capital demand (proposition 1 of the model). For this, I estimate the following generalized difference-in-differences specification:

$$\log(k)_{cit} = \beta_1 D_{ct} \cdot EFD_i + \eta_{ct} + \eta_{ci} + \varepsilon_{cit}, \quad (10)$$

where k_{cit} denotes capital of country c in industry i in year t . D_{ct} is the financial liberalization dummy that equals one in the year the country liberalizes and onwards, and zero otherwise. The specification includes a full set of country \times year and country \times industry fixed effects.¹⁵ The ability to employ a variety of fixed effects is a major strength of the empirical analysis. The use of fixed effects is particularly powerful in a three-dimensional panel, since it allows using interacted fixed effects, which enables controlling for a wide array of omitted variables. The standard errors of this and all country-level regressions are clustered at the country level and computed using block-bootstrapping.¹⁶

The coefficient of interest is β_1 . Proposition 1 states that financial liberalization increases capital demand particularly in industries with high financial needs, so I expect $\beta_1 > 0$. The coefficient is identified purely from the cross-industry variation within a country. The results are reported in column (1) of table 2. The double-interaction term is positive and highly significant at the 1% level. To interpret the magnitude of the result, note that the differential effect of the reform on two industries with different levels of financial dependence is $\beta_1(EFD_h - EFD_l)$. The point estimate implies that liberalizing financial markets increases capital demand in the 75th-

¹⁵Country \times year fixed effects absorb time-varying country characteristics, such as the overall level of development, growth, and country-wide reforms. Country \times industry fixed effects capture the peculiar characteristics of each industry within each country. The results are robust to the inclusion of industry \times year fixed effects joint with either country \times year or country \times industry fixed effects. When I include all three sets of fixed effects simultaneously, the point estimates remain unchanged but the standard errors increase substantially because the large set of fixed effects soaks up most of the variation in inequality in the sample.

¹⁶Clustering at the country level yields standard errors that are consistent in the presence of any intraclass correlation across industries within a country and any serial correlation within a country across time (Bertrand et al., 2004). Since there are relatively few countries, I use block bootstrapping to get unbiased standard errors.

percentile industry by financial dependence by 7% more than in the 25th-percentile industry.¹⁷ The magnitude of this effect is sizable, because the standard deviation of country-level (log) capital after accounting for fixed effects is 50%. Put differently, the differential effect explains 15% of the variation of capital in the sample.¹⁸

[Include table 2 here]

To analyze the effect of financial liberalization on wage inequality (proposition 2), I estimate the following generalized triple difference-in-differences specification:

$$\log(\omega)_{cit} = \beta_1 D_{ct} \cdot EFD_i + \beta_2 D_{ct} \cdot CSC_i + \beta_3 D_{ct} \cdot EFD_i \cdot CSC_i + \eta_{ct} + \eta_{ci} + \varepsilon_{cit} \quad (11)$$

The coefficient of interest is β_3 . According to proposition 2, financial liberalization increases wage inequality disproportionately in industries with high financial needs and strong complementarity, so I expect $\beta_3 > 0$. The results of the estimation are reported in column (2) of table 2. The triple-interaction term is positive and highly significant at the 1% level. The differential effect of the policy on two industries with different levels of financial dependence and complementarity is $\beta_3(EFD_h - EFD_l)(CSC_h - CSC_l)$. Financial liberalization therefore increases wage inequality in the 75th-percentile industry by financial dependence and complementarity by 2.7% more than in the 25th-percentile industry.¹⁹ The differential effect is large in magnitude, and accounts for 43% of the variation of country-level (log) wage inequality after accounting for fixed effects.

I also analyze the effect of the reform on relative labor, defined as the ratio of skilled to unskilled working hours. I re-estimate equation (11) using relative labor as the dependent variable. Results are reported in column (3) of table 2. As can be seen, even though the triple-interaction term is positive, it is estimated imprecisely and is not statistically different from zero. This result is consistent with the fact that my sample is composed of mostly European countries, which have rigid labor markets and therefore low industry labor mobility.

According to the third proposition of the model, the effect on wage inequality across industries should be increasing in the degree of labor market rigidity. I study how my results vary

¹⁷The 75th and 25th-percentile industries by financial dependence are real estate activities and health and social work.

¹⁸The bottom lines of all tables show the differential effect across industries and the fraction of the variation of the dependent variable that this differential effect can explain.

¹⁹The 75th and 25th-percentile industries by the product between financial dependence and CSC are manufacturing of coke products and retail trade.

according to different labor market institutions. I use the [Botero et al. \(2004\)](#) labor regulation index to measure country-level labor rigidity.²⁰ The index is the sum of four job-security variables: grounds for dismissal protection, protection regarding dismissal procedures, notice and severance payments, and protection of employment. The index is reported in Appendix B. Some countries have quite rigid labor markets (e.g. France and Portugal) while others more flexible labor markets (e.g. U.K. and Ireland).

I divide the sample into countries with labor rigidity above and below the median of the index across all countries. The dispersion of wage inequality across industries is higher in the subset of countries with high labor rigidity, which is consistent with the idea that more rigidity is associated with less industry mobility.²¹ I then re-estimate equation (11) for each group of countries separately. The results are reported in columns (1) and (2) of table 3. While the effect on inequality in both groups is significant, the magnitude of the effect for high-rigidity countries is almost twice as large as that for low-rigidity countries. I nest both estimations in one single estimation and reject the hypothesis of equal coefficients across country groups at the 10% level.

[Include table 3 here]

Next, I conduct the same exercise as above except for relative labor. Columns (3) and (4) of table 3. As can be seen, the triple-interaction coefficient is not statistically different from zero in countries with high labor rigidity, while in countries with low rigidity it is high in magnitude and statistically significant. A test of equality of coefficients across country groups is strongly rejected at the 1% level. Summing up, the results show that in high-rigidity countries the adjustment to the reform is done primarily through relative wages, whereas in countries with flexible labor markets the adjustment is done through relative quantities.

6.2 State-level results

I do not analyze the effect of bank deregulation on capital demand since I lack data on U.S. physical capital at the state×industry×year level. However, [Cetorelli and Strahan \(2006\)](#) have shown that bank deregulation in the U.S. increased the number of establishments, and hence capital demand, particularly in industries dependent on external finance. This evidence supports the first proposition of the model.

²⁰The results are robust to using different labor rigidity indices, such as the [Forteza and Rama \(2006\)](#) index.

²¹In 1995, the standard deviation of (log) wage inequality across industries in the group of countries above the median was 22% higher than for the group below the median.

To analyze the effect of state-level deregulation on wage inequality (proposition 2), I estimate a generalized triple difference-in-differences specification:

$$\log(\omega)_{sit} = \beta_1 D_{st} \cdot EFD_i + \beta_2 D_{st} \cdot CSC_i + \beta_3 D_{st} \cdot EFD_i \cdot CSC_i + \eta_{st} + \eta_{si} + \varepsilon_{sit}, \quad (12)$$

where ω_{sit} denotes wage inequality of state s in industry i in year t . D_{st} is the banking deregulation dummy that equals one in the year state s deregulates and onwards, and zero otherwise. The estimation includes state \times year and state \times industry fixed effects. The standard errors of all state-level regressions are clustered at the state level.

The results are shown in column (1) of table 4. The triple-interaction term is positive and significant at the 10% level. According to the point estimate, banking deregulation increases inequality in the 75th-percentile by financial dependence and CSC by 1% more than in the 25th-percentile industry. This differential effect explains 10% of the variation in state-level (log) wage inequality after accounting for fixed effects. Note that the fraction of variation of state-level inequality explained by deregulation is lower than what was found in the country-level analysis. This is consistent with the fact that the U.S. has relatively more flexible labor markets. Column (2) of table 4 shows the results of estimating equation (12) using relative labor as the dependent variable. The effect of deregulation on relative labor, unlike what was found in the country-level analysis, is now highly significant and large in magnitude. The differential effect across industries is 1.5%, which accounts for roughly 20% of the variation in relative labor after controlling for fixed effects. Hence, the adjustment of the U.S. labor market to the banking reforms is done through both relative wages and relative quantities.

[Include table 4 here]

Even though the U.S. is a country with flexible labor markets when compared to Europe, there is still heterogeneity in labor institutions across states. One particular law that varies across states is the right to work law (RTW). A RTW law guarantees that no person can be compelled, as a condition of employment, to join or pay dues to a labor union. These statutes are enforced in twenty-two U.S. states (mainly from the South), allowed under provisions of the Taft-Hartley Act. Given that there are union wage differentials across workers within an industry and union membership varies across industries, relative wage differentials are expected to prevail more in states with more unionization. Since the evidence shows that RTW laws strongly reduce the extent of unionization (Moore, 1998), I use these laws as a proxy for labor market flexibility.²²

²²In 1995, the standard deviation of (log) wage inequality across industries in states with no RTW laws was

I divide the sample into the states that don't have RTW laws and the ones that do and re-estimate equation (12) for each of the two subsamples. Results are reported in table 5. As can be observed from columns (1) and (2), the effect of deregulation is large and significant for the no-RTW states, while it is not statistically different from zero for the RTW states. Even though the point estimate is 40% larger for the states with no RTW laws, I cannot reject the hypothesis of equal coefficients across both groups of states. Columns (3) and (4) repeat the analysis for relative labor. The effect is large and significant for the RTW states, whereas the triple-interaction coefficient is not statistically different from zero for the no-RTW states. A test of equality of coefficients across both groups is strongly rejected at the 1%. Overall, the evidence presented is consistent with the third proposition of the model.

[Include table 5 here]

7 Additional empirical results

7.1 Dynamics

Next, I examine the dynamics of the relationship between country-level financial liberalization and wage inequality. I include a series of dummy variables in regression (11) to trace out the year-by-year effects of liberalization on inequality.²³

$$\log(\omega)_{cit} = \sum_{j \in \mathcal{J}} \beta_1^j D_{ct}^{j-11} \cdot EFD_i + \sum_{j \in \mathcal{J}} \beta_2^j D_{ct}^{j-11} \cdot CSC_i + \sum_{j \in \mathcal{J}} \beta_3^j D_{ct}^{j-11} \cdot EFD_i \cdot CSC_i + \eta_{ct} + \eta_{ci} + \varepsilon_{cit},$$

where $\mathcal{J} = \{1, \dots, 26\} \setminus \{11\}$ and the liberalization dummies equal zero, except as follows: D^{-j} equals one for countries in the j th year before liberalization, while D^{+j} equals one for countries in the j th year after liberalization. I exclude the year of liberalization, thus estimating the dynamic effect on inequality relative to the year of liberalization. Figure 2 plots the series of coefficients $\{\beta_3^j\}_{j \in \mathcal{J}}$ and the corresponding 95% confidence intervals after centering the estimates on the year of the reform. As can be seen, innovations in wage inequality did not precede liberalization, since the coefficients on the liberalization dummies are not significantly different from zero before the reform. The impact on inequality materializes after the third year of the reform. Finally, the effect shows strong persistence, growing for about six years after liberalization, then leveling off, and finally starting to dissipate after 13 years. Thus, even

12% higher than in states with those laws, which is consistent with the no-RTW states having less labor mobility across industries.

²³See Beck et al. (2010) for a similar exercise.

though the differential effect of the policy should disappear in the very long run, there is a very persistent effect during the transition.

[Include figure 2 here]

7.2 College enrollment

In the model developed in section 3, the aggregate supply of both types of labor was assumed to be inelastic. However, if financial liberalization leads to higher wage inequality, higher education should increase as the result of agents taking advantage of the higher returns to skill. In the previous section I estimated the differential effect of financial liberalization on inequality across industries. Given that countries and states differ in their industrial composition, the effect of the reform on aggregate inequality will differ as well. As a result, higher education should increase particularly in countries and states with a large proportion of production in the industries that are most affected by the reform.

To test this hypothesis, I create an aggregate index indicating the exposure of a country or a state to the industries most affected by the reform. I define the exposure index as a weighted average of the product of both sectoral indices, i.e. $Exp_m = \sum_i \bar{\omega}_{im} \cdot (EFD_i \cdot CSC_i)$ for $m \in \{c, s\}$. Here $\bar{\omega}_{ic}$ ($\bar{\omega}_{is}$) denotes the average share of production of industry i in overall production of country c (state s). The index will achieve its maximum value if all production is allocated to the industry with the highest combination of financial needs and CSC (post and telecommunications).

I estimate the effect of financial liberalization on college enrollment using a generalized difference-in-differences specification:

$$\log(E)_{mt} = \beta_1 D_{mt} + \beta_2 D_{mt} \cdot Exp_m + \eta_m + \eta_t + \varepsilon_{mt} \quad \text{for } m \in \{c, s\}, \quad (13)$$

where E_{ct} (E_{st}) denotes college enrollment of country c (state s) in year t . The coefficient of interest is β_2 , which is identified from the cross-country (cross-state) variation in financial liberalization. I expected that $\beta_2 > 0$.

The results for the country-level analysis are shown in column (1) of table 6. As can be seen, the interaction term is large and significant at the 5% level. The estimate implies that liberalizing financial markets increases college enrollment in the 75th-percentile country by exposure index (Germany) by 7% more than in the 25th-percentile country (Poland). In other words, financial liberalization explains about 15% of the variation of country-level (log) college enrollment after controlling for fixed effects. Column (2) shows the results for the case of U.S.

bank deregulation. The effect is also positive and significant. According to the results, college enrollment in a deregulating state at the 75th-percentile of the exposure index (Texas) increases by 3% more than a state at the 25th-percentile (South Carolina). This means that deregulation explains 40% of the variation of state-level (log) college enrollment after controlling for fixed effects.

Given that this analysis has been conducted at the aggregate level, instead of exploiting differences across industries, the results should not be necessarily given a causal interpretation. Nevertheless, they are consistent with the idea that financial liberalization is increasing the returns to skill, and agents are taking advantage of this by increasing college attendance.

7.3 Contract enforcement

To further support the results found in the paper, I analyze how the effect of financial liberalization on wage inequality varies according to a country's contracting institutions. Since financial liberalization increases financial depth particularly in countries with solid contracting institutions (Galindo et al., 2002), the effect on inequality should be increasing in contract enforcement strength.

I use the index created by Djankov et al. (2008) as a measure of country-level debt enforcement. Insolvency practitioners from several countries describe how debt enforcement proceeds against an identical firm about to default on its debt.²⁴ Appendix B reports the index for my sample of countries.

I divide the sample into countries with the enforcement index above and below the median of the index across all countries. I then re-estimate equation (11) for each of the two sub-samples. The results are reported in columns (1) and (2) of table 7. While the triple interaction term is highly significant for the group of high-enforcement countries (column (1)), it is not significant for the low-enforcement group (column (2)). The coefficients of both sub-samples are statistically different from each other. The evidence is thus consistent with financial liberalization being complementary to contract enforcement institutions.

[Include table 7 here]

²⁴The authors use the data on time, cost, and the likely disposition of the assets to construct a measure of the efficiency of debt enforcement in each country.

7.4 Endogeneity

As explained in subsection 4.1, a potential threat to identification would be that other policies concurrent to financial liberalization could be driving the results. To be a real threat, these potential confounding factors would necessarily have to increase inequality exclusively in the subset of industries with both high financial needs and strong complementarity. In this section I argue that this is highly unlikely.

Consider first consider skilled-biased technological change (SBTC). SBTC is a shift in the production technology that favors skilled relative to unskilled labor by increasing its relative productivity. Since SBTC increases the relative demand for skilled labor, it should also increase wage inequality. The effect might be particularly strong in industries with high CSC. Nevertheless, there is not reason to expect that the effect should be disproportionately large in industries heavily dependent on external finance. Moreover, the effect of SBTC on inequality is expected to be independent of the level of debt enforcement of an economy. As a result, the finding that the effect of the reform on inequality is increasing in the level of enforcement is inconsistent with SBTC causing the rise in inequality.

I next analyze trade liberalization. According to the Stolper-Samuelson Theorem, trade opening increases the relative price of a country's abundant factor. Given that most countries in my sample are skill-abundant, one concern is that simultaneous changes in trade policy might be increasing the relative wage of skilled labor. In addition, a reduction in trade costs could also decrease the price of capital, increasing imports of capital goods (Parro, 2011). If production functions exhibit CSC, this capital deepening could increase wage inequality as well. However, there is no reason to believe that the tariffs and the price of capital goods were reduced particularly in industries with high needs for external finance and strong complementarity. Furthermore, even though the countries in my sample have made some free-trade agreements in the last three decades, the bulk of tariff and non-tariff reductions took place at least a decade before financial deregulation (Wacziarg and Welch, 2008).

I also consider changes in creditor rights. When a country improves the laws that protect the legal right of investors, savers are more willing to finance firms and thus financial markets flourish. This could increase wage inequality in industries with high finance needs and strong CSC and present a threat to my identification. To deal with this issue, I explicitly control for these reforms by using the time-varying creditor rights index developed by Djankov et al. (2007). I add to regression (11) a triple-interaction term between the creditor rights reforms and the two sectoral indices (plus the two-way interaction terms). The results are shown in

column (3) of table 7. The triple-interaction term corresponding to creditor rights reforms is not statistically different from zero and the triple-interaction term corresponding to financial liberalization remains unchanged.

Finally, another threat to identification is that a third factor that increases inequality could be triggering the decision to deregulate. In the case of the state-level reforms, this factor could be a technological shock that improved telecommunications; for the country-level reforms, it could be a balance of payment crisis. In either case, while these shocks could increase wage inequality, there is no reason to expect that inequality increased exclusively in the subset of industries with both high financial needs and strong complementarity.

7.5 Robustness checks

I also conduct a series of robustness checks to analyze the validity of my results. First, instead of using the original industry indices (which are continuous) I use binary indices, which impose less structure for the estimating equation (11). In particular, I re-define the external financial dependence and CSC index as binary variables that are equal to one if the original index is above the median of the index across all industries and zero otherwise. The treatment group now consists of industries with both indices above their respective median values; the remaining industries make up the control group. Results are presented in column (1) of table 8. The triple interaction remains significant at the 1% level. The reform increases inequality in the treatment group by 4% more than in the control group.

[Include table 8 here]

Second, I use an alternative industry measure of financial vulnerability. As argued by Braun (2003) and Claessens and Laeven (2003), firms might find it easier to raise outside capital in industries that employ more tangible assets that can serve as collateral. These papers construct an industry asset tangibility index as the share of net plant, property, and equipment in total assets for the median publicly-traded firm in an industry in the U.S.²⁵ The results are shown in column (2) of table 8. The triple-interaction term is negative and significant at the 1% level. This means that a financial reform increases inequality particularly in industries with low asset tangibility and strong CSC, as expected.

Next, I use the original Abiad et al. (2010) financial liberalization index, which is a continuous measure of reform, as opposed to the binary measure used in the main part of the

²⁵Using COMPUSTAT data, I extend the index to include both manufacturing and non-manufacturing industries.

paper. As can be seen in column (3) of table 8, the triple-interaction term remains positive, large, and highly significant at the 1% level. In addition, I use an alternative financial reform index, developed by Kaminsky and Schmukler (2008). The index has been used previously to study the effects of financial liberalization on economic growth (Levchenko et al., 2009). It is the composite of three subcomponents: liberalization in the stock market, the banking system, and freedom of international transactions. Using this reform index reduces the sample to 12 countries. Results are shown in column (4) of table 8. Again, the triple-interaction term remains positive and significant at the 1% level. The magnitude of the effect actually increases by 40%.

Finally, I analyze whether the results change if I modify the composition of countries in the sample. To study a more homogenous group of countries, I focus only on European countries, excluding Australia, Korea, and Japan from the analysis. The results are shown in column (5) of table 8. The effect remains highly significant and the magnitude does not change.

8 Structural analysis

With the reduced form analysis, I have estimated the *differential* effect of financial liberalization on inequality across industries. However, understanding the effects of the reform on *aggregate* inequality is very important for policy reasons. Since with the diff-in-diffs approach I cannot identify the level impact, in this section I conduct a structural analysis to analyze the overall effect of the policy. An additional benefit of the model-based analysis is that it allows to study the effects on *absolute* wages, not only on *relative* wages. Before proceeding, I use the results of the empirical analysis to obtain a lower bound for the aggregate effect.

8.1 Lower bound for aggregate effect

I collapse my sample of industries into two groups. The first group is conformed by all industries for which the product between the external financial and CSC index is above the median value of the product across all industries. The remaining industries constitute the second group. The percentage change in aggregate inequality is a weighted average of the change in inequality in both groups of industries:

$$\hat{\omega} = \tau\hat{\omega}_1 + (1 - \tau)\hat{\omega}_2, \quad (14)$$

where τ is the share of total labor in industry 1, relative to total labor in both industries, i.e. $\tau = \frac{s_1 + u_1}{\sum_i s_i + u_i}$. If the level effect on the second subset of industries is labeled x_0 , then the change

in aggregate inequality is $\widehat{\omega} = \tau(x_0 + \delta) + (1 - \tau)x_0$, where δ denotes the differential effect. Setting $x_0 = 0$ yields a lower bound for the aggregate effect, $\widehat{\omega} = \tau\delta$. From the country-level reduced form analysis, I know that $\delta_{country} = 3.0\%$ and I can compute $\tau_{country} = 0.33$. Likewise, for the state-level reforms, I have $\delta_{state} = 1.0\%$ and $\tau_{state} = 0.51$. Therefore, the lower bound for the aggregate increase in inequality for the average European country is $\widehat{\omega}_{country} = 1.0\%$ and for the U.S. is $\widehat{\omega}_{state} = 0.7\%$.

8.2 Parameter estimation and calibration

To conduct the structural analysis, I must measure the size of the shock, $\widehat{\theta}$, and, as shown in Appendix A, the following list of structural parameters: $\psi, (\lambda_{si}, \lambda_{ui})_{i \in \{1,2\}}, (\theta_{ki}, \theta_{si}, \theta_{ui})_{i \in \{1,2\}}, (\sigma_i^{ks}, \sigma_i^{ku}, \sigma_i^{su})_{i \in \{1,2\}}, \delta$. I will calibrate the size of the shock and estimate the structural parameters directly. I will conduct the exercise for both the country-level and the state-level reforms.

I start by estimating the structural parameters. I conduct the estimation using only pre-reform data. Consider first the labor market rigidity parameter ψ . I take logs of equation (2), collapse the data into two sub-group of industries, and estimate the following equation for the country-level and state-level reforms:

$$\log \left(\frac{u_1}{u_2} \right)_{mt} = \psi \log \left(\frac{w_{u1}}{w_{u2}} \right)_{mt} + \eta_m + \eta_t + \varepsilon_{mt} \quad \text{for } m \in \{c, s\}$$

This equation delivers immediately an estimate of the labor market friction parameter. The estimates of this and the rest of the parameters are presented in table 9. As expected, labor market mobility is much higher in the U.S. than in Europe.

To estimate the factor allocative shares across industries, note that by definition, $\lambda_{j1} = j_1/(j_1 + j_2)$ and residually $\lambda_{j2} = 1 - \lambda_{j1}$, for $j \in \{s, u\}$. The shares are calculated as an average across countries (states) and time for each group of industries. To estimate the cost of different factors within an industry, note that by definition $\theta_{ki} = rk_i/(rk_i + w_s s_i + w_{ui} u_i)$, $\theta_{si} = w_s s_i/(rk_i + w_s s_i + w_{ui} u_i)$, and residually $\theta_{ui} = 1 - \theta_{ki} - \theta_{si}$, for $i \in \{1, 2\}$.

To estimate the elasticities of substitution among the three factors, I approximate the cost function in each industry to a Translog function and obtain the following system of share equations for each industry:

$$\mathcal{S}_h = \alpha_h + \beta_{hy} \log(y) + [\gamma_{hk} \log(r) + \gamma_{hs} \log(w_s) + \gamma_{hu} \log(w_u)] \quad \text{for } h \in \{k, s, u\}$$

I estimate this system for each group of industries using Zellner's seemingly unrelated regressions (SUR) procedure to ensure consistency among factor cross-price elasticities. I then

recover the Allen-Uzawa elasticity of substitution between factors $h, m \in \{k, s, u\}$ as follows:

$$\sigma_{hm} = \frac{\gamma_{hm}}{\mathcal{S}_h \cdot \mathcal{S}_m} + 1$$

I conduct the estimation only for the country-level reforms, since I lack the relevant data for the U.S. case. I will assume that the elasticities of substitution are the same in Europe and the U.S. As can be seen from table 9, the elasticity of substitution between capital and unskilled labor is higher than the elasticity between capital and skilled labor in the first group of industries, which is expected because this group of industries exhibits strong CSC. In the second group of industries, both elasticities are of similar magnitude.²⁶

To estimate the parameter δ , which summarizes the asymmetry of the financial friction across industries, note that in the model $\widehat{k}_1 - \widehat{k}_2 = (1 - \delta)\widehat{\theta}$. From the reduced form analysis, the differential effect on capital demand is 7%, i.e. $\widehat{k}_1 - \widehat{k}_2 = 7\%$. As a result, I set $\delta = 1 - \frac{7\%}{\widehat{\theta}}$. Since I have no data on capital for the U.S. reforms, I assume again that this parameter is equal for both sets of reforms.

Finally, I calibrate the size of the shock $\widehat{\theta}$ in order to match the prediction of the model regarding the differential effect of inequality across industries with the results obtained in the reduced form analysis. That is, for the country-level reforms I set $\frac{\partial(\widehat{\omega}_1/\widehat{\omega}_2)}{\partial\widehat{\theta}} = \Omega(\cdot) = 3\%$ and for the state-level reforms $\frac{\partial(\widehat{\omega}_1/\widehat{\omega}_2)}{\partial\widehat{\theta}} = \Omega(\cdot) = 1\%$.

8.3 Aggregate wage inequality

After fitting the structural parameters to the model, I can simulate a financial reform and analyze the effect on aggregate inequality (see equation (14)). For the country-level reforms, I find that financial liberalization increased aggregate inequality for the average country by 1.6%. For the U.S. state-level reforms, financial deregulation increased aggregate inequality by 1.2%. These figures are 60% and 70% respectively higher than the lower bound calculations based on the reduced form analysis.

To gauge the size of importance effects, it is useful to compare them with the pattern of aggregate inequality observed in the data. Consider, for example, the U.K. case. The U.K. is a European country where inequality increased dramatically in the last decades. Labor markets in the U.K. are more flexible than the average European country. Since the effect of the reform on aggregate inequality is increasing in labor market flexibility, the analysis for the U.K. will

²⁶All elasticities of substitution estimated in this section are of similar magnitude to those reported in the micro literature (Hamermesh, 1993).

provide a lower bound for the true effect. Between 1980 and 2000, aggregate British wage inequality, in the industries included in my sample, increased by 8%. With this analysis, I can attribute 20% of the total rise in inequality to financial liberalization. Consider now the U.S. case. Aggregate wage inequality in the U.S. increased by 10% in the 1980-2000 period. As a result, bank deregulation contributes 12% to the rise in inequality. Therefore, the contribution of financial liberalization on wage inequality in both the U.K. and the U.S. is sizable.

It is worth noting that the time horizon of this analysis is short to medium-run. In the long-run, labor is able to move across industries. In terms of the model, this means that labor markets become fully flexible. Since the effect of the reform on aggregate inequality is increasing in labor market flexibility, the figures presented in this section are conservative and represent a lower bound for the long-run effect.

8.4 Level of wages

Finally, since the concept of capital-skill complementarity is by definition relative (capital increases the *relative* demand for skilled labor), the reduced form analysis can only inform about relative wages, not about absolute wages. Absolute wages can either increase or decrease as the capital stock increases. Consider two production functions that exhibit capital-skill complementarity, $y = (k + u)^\alpha s^{1-\alpha}$ and $y = (\min\{k, s\})^\alpha u^{1-\alpha}$, with $\alpha \in (0, 1)$. In the first case, the absolute unskilled wage falls if capital increases. In the second case, the absolute skilled wage increases.

An additional benefit of the structural analysis is that it allows to analyze the effect on absolute wages, since I have not imposed any structure on the production function besides CSC and constant returns to scale. After simulating a financial reform in the model, I find that the absolute wages of both skilled and unskilled workers increase in absolute levels (in terms of the numeraire). Therefore, according to this analysis, financial liberalization is a policy that is Pareto improving for employees. That is, all workers benefit from the reform, but skilled workers benefit relatively more.

9 Conclusions

The development of financial markets can affect both economic growth and income inequality. While economists have studied thoroughly the effects of financial sector policies on growth, the potentially enormous impact of such policies on inequality has been under appreciated. As documented by [Demirguc-Kunt and Levine \(2009\)](#), the three volumes of the *Handbook of*

Income Distribution do not mention any possible connections between inequality and formal financial sector policies. In this paper, I argue that the deregulation of financial markets has contributed to the rise in wage inequality observed in the last three decades in several developed countries.

I focus on a particular mechanism through which improvements in financial markets can affect wage inequality. According to theory, financial liberalization reduces borrowing constraints and increases capital demand. If capital and skilled labor are relative complements, the relative demand for skilled labor should increase, enlarging the wage gap between skilled and unskilled workers in equilibrium. The higher the extent of financial needs and the higher the degree of CSC, the stronger the effect on inequality. The effect should be particularly strong in industries with both high needs for external finance and strong complementarity. I rank industries in these two dimensions by using a standard measure of financial needs and constructing a novel measure of the industry-level degree of CSC. I then analyze the differential effect of liberalization on inequality across industries.

I focus on two distinct episodes of financial liberalization: country-level financial deregulation across a large group of countries and state-level bank deregulation across states in the U.S. I find that, in both episodes, liberalization led to a disproportional increase of wage inequality in industries with high financial needs and strong CSC. I also find that while the differential effect on relative wages is increasing in labor market rigidity, the differential effect on relative labor flows is increasing in labor flexibility. Finally, I conduct a structural analysis and simulate a financial reform in the context of a two-sector general equilibrium model. I calibrate the model in order to match the prediction regarding differential inequality with the results obtained in the reduced form analysis. I use the structural model to gauge the magnitude of the reform on aggregate inequality and find that the effect is sizable. I also find that the reform increases the level of both skilled and unskilled wages.

This paper contributes to a broader research agenda seeking to understand the relationship between finance and inequality. In this particular work, I have focused on the effects of a permanent improvement of financial markets on inequality. In a companion paper ([Larrain, 2011](#)), I study how recessions associated with financial crises, which represent a transitory deterioration of financial markets, affect inequality. Since borrowing constraints become more binding during financial crises, capital demand should fall and, in the presence of CSC, so should the relative demand for skilled labor and thus its relative price. I find that financial crises decrease wage inequality disproportionately in industries with high financial needs and

strong complementarity. These findings are consistent with the results found in this paper and further support the link between finance and inequality highlighted in this work.

In this research, I have analyzed the effect of financial liberalization on wage inequality by focusing on changes on the relative demand for skilled labor. However, if investment in human capital is subject to borrowing constraints, financial development might ease these constraints as well ([Galor and Zeira, 1993](#)). This could lead to an increase in the relative supply of skilled labor, which could drive wage inequality down. While there is abundant evidence that financial liberalization alleviates borrowing constraints for physical capital investment ([Laeven, 2003](#); [Correa, 2008](#)), there is no equivalent evidence for human capital investment. Nevertheless, the joint analysis of these two effects could lead to interesting results and is left for future research.

Finally, in this paper I have analyzed only one dimension of income inequality, namely the wage difference between skilled and unskilled workers. Financial liberalization can have different effects on other dimensions of inequality, such as on inequality of opportunities or on intergenerational persistence of relative income differences. Analyzing the effects of financial reform on these different dimensions of inequality could represent an interesting opportunity for further research.

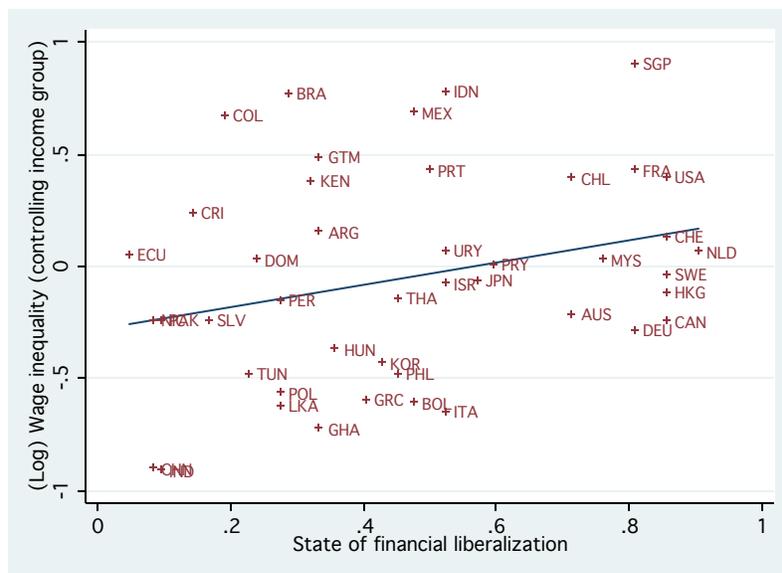
References

- Abiad, A., Detragiache, E., and Tressel, T. (2010). A new database of financial reforms. *IMF Staff Papers*, 57(2):281–302.
- Abiad, A. and Mody, A. (2005). Financial reform: What shakes it? What shapes it? *American Economic Review*, 95(1):66–88.
- Arellano, M. and Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, 58(2):277–297.
- Autor, D. H., Katz, L. F., and Krueger, A. B. (1998). Computing inequality: Have computers changed the labor market? *Quarterly Journal of Economics*, 113(4):1169–1213.
- Beck, T., Levine, R., and Levkov, A. (2010). Big bad banks? The winners and losers from bank deregulation in the United States. *Journal of Finance*, 65(5):1637–1667.
- Benmelech, E., Bergman, N. K., and Seru, A. (2011). Financing labor. *NBER working paper*, 17144.
- Berman, E., Bound, J., and Griliches, Z. (1994). Changes in the demand for skilled labor within U.S. manufacturing: Evidence from the annual survey of manufacturers. *Quarterly Journal of Economics*, 109(2):367–397.
- Bertrand, M., Duflo, E., and Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics*, 119(1):249–275.
- Bhagwati, J., Panagariya, A., and Srinivasan, T. (1998). *Lectures on International Trade*. MIT Press, 2nd edition.
- Botero, J. C., Djankov, S., La-Porta, R., Lopez-De-Silanes, F., and Shleifer, A. (2004). The regulation of labor. *Quarterly Journal of Economics*, 119(4):1339–1382.
- Braun, M. (2003). Financial contractibility and asset hardness. *Mimeo, Harvard University*.
- Braun, M. and Raddatz, C. (2007). Trade liberalization, capital account liberalization and the real effects of financial development. *Journal of International Money and Finance*, 26(5):730–761.
- Casas, F. (1984). Imperfect factor mobility: A generalization and synthesis of two-sector models of international trade. *Canadian Journal of Economics*, 17(4):747–761.
- Caselli, F. and Coleman, W. J. (2006). The world technology frontier. *American Economic Review*, 96(3):499–522.
- Cetorelli, N. and Strahan, P. E. (2006). Finance as a barrier to entry: Bank competition and industry structure in local U.S. markets. *Journal of Finance*, 61(1):437–461.
- Chari, A., Henry, P. B., and Sasson, D. (2009). Capital market integration and wages. *NBER*

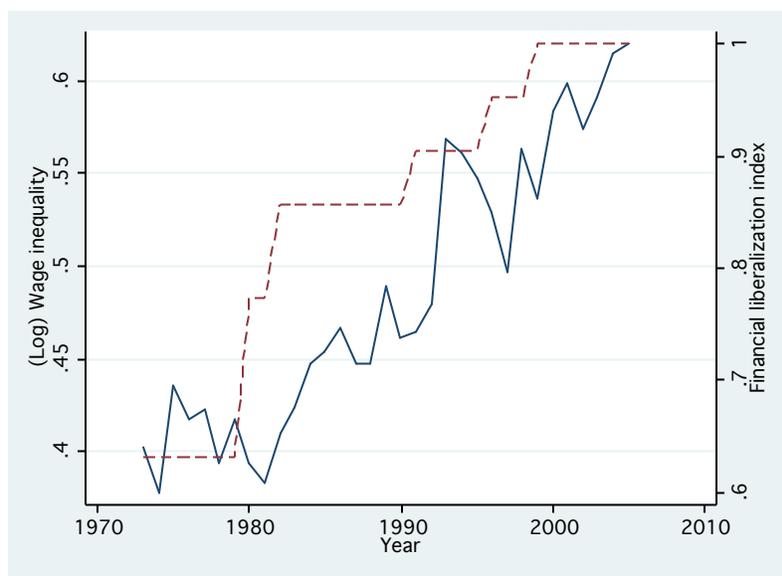
- working paper*, 15204.
- Claessens, S. and Laeven, L. (2003). Financial development, property rights, and growth. *Journal of Finance*, 58(6):2401–2436.
- Correa, R. (2008). Bank integration and financial constraints: Evidence from U.S. firms. *FRB International Finance Discussion Paper*, 925.
- Davis, S. J., Haltiwanger, J., Katz, L. F., and Topel, R. (1991). Wage dispersion between and within U.S. manufacturing plants, 1963-86. *Brookings Papers on Economic Activity*, 1991:115–200.
- Demirguc-Kunt, A. and Levine, R. (2009). Finance and inequality: Theory and evidence. *Annual Review of Financial Economics*, 1(1):287–318.
- DiNardo, J., Fortin, N. M., and Lemieux, T. (1996). Labor market institutions and the distribution of wages, 1973-1992: A semiparametric approach. *Econometrica*, 64(5):1001–44.
- Djankov, S., Hart, O., McLiesh, C., and Shleifer, A. (2008). Debt enforcement around the world. *Journal of Political Economy*, 116(6):1105–1149.
- Djankov, S., McLiesh, C., and Shleifer, A. (2007). Private credit in 129 countries. *Journal of Financial Economics*, 84(2):299–329.
- Duffy, J., Papageorgiou, C., and Perez-Sebastian, F. (2004). Capital-skill complementarity? Evidence from a panel of countries. *Review of Economics and Statistics*, 86(1):327–344.
- Forteza, A. and Rama, M. (2006). Labor market rigidity and the success of economic reforms across more than 100 countries. *Journal of Policy Reform*, 9(1):1384–1289.
- Galindo, A., Micco, A., Ordoez, G., and Bris, A. (2002). Financial liberalization: Does it pay to join the party? *Economia*, 3(1):231–261.
- Galor, O. and Zeira, J. (1993). Income distribution and macroeconomics. *Review of Economic Studies*, 60(1):35–52.
- Griliches, Z. (1969). Capital-skill complementarity. *Review of Economics and Statistics*, 51(4):465–468.
- Gupta, N. and Yuan, K. (2009). On the growth effect of stock market liberalizations. *Review of Financial Studies*, 22(11):4715–4752.
- Hamermesh, D. S. (1993). *Labor Demand*. Princeton University Press.
- Haskel, J. (1998). The skilled wage premium and the growth of small firms in UK manufacturing. *LABOUR*, 12(2):221–238.
- Jerzmanowski, M. and Nabar, M. (2011). Financial development and wage inequality: Theory and evidence. *Economic Inquiry*, Forthcoming.

- Kaminsky, G. L. and Schmukler, S. (2008). Short-run pain, long-run gain: Financial liberalization and stock market cycles. *Review of Finance*, 12(2):253–292.
- Katz, L. F. and Murphy, K. M. (1992). Changes in relative wages, 1963-1987: Supply and demand factors. *Quarterly Journal of Economics*, 107(1):35–78.
- Kroszner, R. S. and Strahan, P. E. (1999). What drives deregulation? Economics and politics of the relaxation of bank branching restrictions. *Quarterly Journal of Economics*, 114(4):1437–1467.
- Krusell, P., Ohanian, L. E., Rios-Rull, J.-V., and Violante, G. L. (2000). Capital-skill complementarity and inequality: A macroeconomic analysis. *Econometrica*, 68(5):1029–1053.
- Laeven, L. (2003). Does financial liberalization reduce financing constraints? *Financial Management*, 32(1):5–34.
- Larrain, M. (2011). Financial crises and wage inequality. *Mimeo, University of California, Berkeley*.
- Levchenko, A. A., Ranciere, R., and Thoenig, M. (2009). Growth and risk at the industry level: The real effects of financial liberalization. *Journal of Development Economics*, 89(2):210–222.
- Moore, W. (1998). The determinants and effects of right-to-work laws: A review of the recent literature. *Journal of Labor Research*, 19:445–469.
- Pagano, M. and Pica, G. (2011). Finance and employment. *CSEF working paper*, 283.
- Parro, F. (2011). Capital-skill complementarity and the skill premium in a quantitative model of trade. *Mimeo, University of Chicago*.
- Philippon, T. and Reshef, A. (2011). Wages and human capital in the U.S. finance industry: 1909-2006. *Mimeo, Stern School of Business, New York University*.
- Rajan, R. G. and Zingales, L. (1998). Financial dependence and growth. *American Economic Review*, 88(3):559–586.
- Ranciere, R., Tornell, A., and Westermann, F. (2006). Decomposing the effects of financial liberalization: Crises vs. growth. *Journal of Banking Finance*, 30(12):3331–3348.
- Uzawa, H. (1962). Production functions with constant elasticities of substitution. *Review of Economic Studies*, 29(4):291–299.
- Wacziarg, R. and Welch, K. H. (2008). Trade liberalization and growth: New evidence. *World Bank Economic Review*, 22(2):187–231.
- Wood, A. (1995). How trade hurt unskilled workers. *Journal of Economic Perspectives*, 9(3):57–80.

Figure 1: Financial liberalization and wage inequality in a cross-section of countries and in the U.S. time series



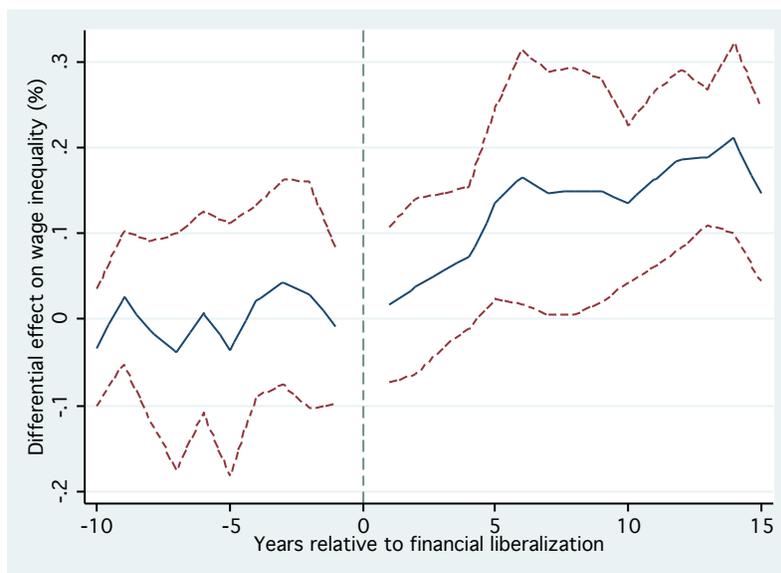
(a) State of financial liberalization and wage inequality in a cross-section of countries



(b) Dynamics of financial liberalization and wage inequality in the U.S.
(Solid line: wage inequality, dashed line: financial liberalization)

Notes: Panel (a) plots the relationship between the state of financial liberalization and wage inequality in a cross-section of 44 countries in 1990. Wage inequality is measured as the residual of an OLS regression between the (log) relative wage of skilled to unskilled labor and country income group (high, medium-high, medium-low, low). Source: [Caselli and Coleman \(2006\)](#) and [Abiad et al. \(2010\)](#). Panel (b) plots the evolution of financial liberalization and wage inequality in the U.S. during the 1975-2005 period. Source: EU-KLEMS and [Abiad et al. \(2010\)](#).

Figure 2: Dynamic effect of country-level financial liberalization on wage inequality



Notes: the figure plots the dynamic impact of country-level financial liberalization on wage inequality. A 25-year window is considered, spanning from 10 years before liberalization until 15 years after liberalization. The dashed lines represent 95% confidence intervals.

Table 1: External financial dependence and capital-skill complementarity indices

Industry	ISIC	(1) EFD index	(2) CSC index [95% C.I.]	(3) EFD·CSC index
Manuf. of wood	20	0.036	0.212 [0.137 , 0.288]	0.008
Manuf. of coke, refined petroleum	23	0.486	0.147 [0.099 , 0.195]	0.071
Manuf. of chemicals	24	1.726	0.313 [0.221 , 0.405]	0.540
Manuf. of rubber, plastics	25	0.011	0.464 [0.369 , 0.559]	0.005
Manuf. of other non-met. mineral prod.	26	-0.045	0.300 [0.221 , 0.380]	-0.014
Manuf. of machinery and equipment	29	-0.059	0.303 [0.237 , 0.370]	-0.018
Construction	45	-0.092	0.266 [0.166 , 0.366]	-0.024
Wholesale trade and commission trade	51	-0.308	0.330 [0.229 , 0.432]	-0.102
Retail trade, except of motor vehicles	52	0.130	-0.220 [-0.306 , -0.13]	-0.029
Hotels and restaurants	55	0.399	-0.017 [-0.112 , 0.07]	-0.007
Post and telecommunications	64	0.679	0.956 [0.804 , 1.108]	0.649
Real estate activities	70	0.312	0.243 [0.088 , 0.399]	0.076
Education	80	-0.295	0.073 [0.040 , 0.105]	-0.022
Health and social work	85	-0.127	0.077 [0.024 , 0.130]	-0.010

Notes: the table reports the external financial dependence index (column (1)), the capital-skill complementarity index with its 95% confidence interval (column (2)), and the product of both indices (column (3)), for the 15 industries in the sample. Financial dependence is defined as the fraction of capital expenditures not financed by cash flow from operations (Rajan and Zingales, 1998). Complementarity is defined as the elasticity of the share of skilled labor in the wage bill to capital intensity (see equation (8)).

Table 2: Effect of country-level financial liberalization on capital, wage inequality, and relative labor

	(1)	(2)	(3)
	Capital demand	Wage inequality	Relative labor
Financial liberalization · EFD	0.184*** (0.065)	-0.086*** (0.021)	0.013 (0.078)
Financial liberalization · CSC		-0.015 (0.024)	0.311** (0.138)
Financial liberalization · EFD · CSC		0.171*** (0.038)	0.181 (0.280)
Differential effect across industries	7.36%	2.74%	0.00%
Fraction of variation explained	14.72%	43.43%	0.00%
Country×year fixed effects	yes	yes	yes
Country×industry fixed effects	yes	yes	yes
Observations	5,100	6,975	6,975
R-squared	0.449	0.940	0.979

Notes: the table presents the estimates of the effect of country-level financial liberalization on capital (column (1)), wage inequality (column (2)), and relative labor (column (3)). EFD stands for external financial dependence and CSC for capital-skill complementarity. The differential effect measures the relative impact of the reform on industries at the 75th and 25th-percentile of the EFD index (column (1)) and at the 75th and 25th-percentile of the product between the EFD and CSC indices (columns (2) and (3)). The fraction of variation explained is the ratio between the differential effect across industries and the standard deviation of the (log) dependent variable, after controlling for fixed effects. Standard errors in parentheses are clustered at the country level using block-bootstrapping. ***, **, * denote statistical significance at 1%, 5%, and 10%.

Table 3: Labor market rigidity and the effect of country-level reforms on wage inequality and relative labor

	— Wage inequality —		— Relative labor —	
	(1) High rigidity countries	(2) Low rigidity countries	(3) High rigidity countries	(4) Low rigidity countries
Financial liberalization · EFD	-0.107*** (0.035)	-0.062*** (0.015)	0.166* (0.093)	-0.159** (0.077)
Financial liberalization · CSC	-0.007 (0.046)	-0.023*** (0.007)	0.473** (0.210)	0.130* (0.076)
Financial liberalization · EFD · CSC	0.215*** (0.059)	0.122*** (0.035)	-0.372 (0.285)	0.797*** (0.306)
Differential effect across industries	3.44%	1.95%	0.00%	12.75%
Fraction of variation explained	54.60%	30.98%	0.00%	68.56%
Country×year fixed effects	yes	yes	yes	yes
Country×industry fixed effects	yes	yes	yes	yes
Observations	3,540	3,435	3,540	3,435
R-squared	0.935	0.947	0.978	0.979

Notes: the table presents the estimates of the effect of country-level financial liberalization on wage inequality (columns (1) and (2)) and relative labor (columns (3) and (4)) for the subsample of countries with high labor rigidity (columns (1) and (3)) and low labor rigidity (columns (2) and (4)). EFD stands for external financial dependence and CSC for capital-skill complementarity. The differential effect measures the relative impact of the reform on industries at the 75th and 25th-percentile of the product between the EFD and CSC indices. The fraction of variation explained is the ratio between the differential effect across industries and the standard deviation of the (log) dependent variable, after controlling for fixed effects. Standard errors in parentheses are clustered at the country level using block-bootstrapping. ***, **, * denote statistical significance at 1%, 5%, and 10%.

Table 4: Effect of state-level bank deregulation on wage inequality and relative labor

	(1)	(2)
	Wage inequality	Relative labor
Bank deregulation · EFD	-0.014 (0.021)	-0.073*** (0.020)
Bank deregulation · CSC	-0.015 (0.012)	-0.132*** (0.010)
Bank deregulation · EFD · CSC	0.054* (0.031)	0.096*** (0.030)
Differential effect across industries	0.96%	1.54%
Fraction of variation explained	9.65%	19.20%
State×year fixed effects	yes	yes
State×industry fixed effects	yes	yes
Observations	15,401	15,401
R-squared	0.340	0.295

Notes: the table presents the estimates of the effect of bank branch deregulation in the U.S. on wage inequality (column (1)) and relative labor (column (2)). EFD stands for external financial dependence and CSC for capital-skill complementarity. The differential effect measures the relative impact of the reform on industries at the 75th and 25th-percentile of the product between the EFD and CSC indices. The fraction of variation explained is the ratio between the differential effect across industries and the standard deviation of the (log) dependent variable, after controlling for fixed effects. Standard errors in parentheses are clustered at the state level. ***, **, * denote statistical significance at 1%, 5%, and 10%, respectively.

Table 5: Right-to-work laws and the effect of state-level reforms on wage inequality and relative labor

	— Wage inequality —		— Relative labor —	
	(1) No RTW states	(2) RTW states	(3) No RTW states	(4) RTW states
Bank deregulation · EFD	-0.016 (0.023)	0.002 (0.024)	0.248 (0.165)	-0.080 (0.075)
Bank deregulation · CSC	-0.004 (0.014)	0.010 (0.013)	-0.214* (0.118)	-0.058 (0.039)
Bank deregulation · EFD · CSC	0.060* (0.035)	0.044 (0.036)	-0.253 (0.159)	0.150** (0.072)
Differential effect across industries	0.96%	0.00%	0.00%	2.40%
Fraction of variation explained	7.38%	0.00%	0.00%	30.00%
State×year fixed effects	yes	yes	yes	yes
State×industry fixed effects	yes	yes	yes	yes
Observations	8,775	6,626	8,775	6,626
R-squared	0.265	0.256	0.300	0.141

Notes: the table presents the estimates of the effect of bank branch deregulation in the U.S. on wage inequality (columns (1) and (2)) and relative labor (columns (3) and (4)) for the subsample of states with no right-to-work laws (columns (1) and (3)) and those with right-to-work laws (columns (2) and (4)). EFD stands for external financial dependence and CSC for capital-skill complementarity. The differential effect measures the relative impact of the reform on industries at the 75th and 25th-percentile of the product between the EFD and CSC indices. The fraction of variation explained is the ratio between the differential effect across industries and the standard deviation of the (log) dependent variable, after controlling for fixed effects. Standard errors in parentheses are clustered at the state level. ***, **, * denote statistical significance at 1%, 5%, and 10%.

Table 6: Effect of country-level and state-level reforms on college enrollment

	(1) Country-level analysis	(2) State-level analysis
Financial deregulation	0.079 (0.051)	-0.014 (0.019)
Financial deregulation · Exposure	2.871** (1.424)	0.534* (0.291)
Differential effect across countries	7.36%	2.70%
Fraction of variation explained	14.72%	39.70%
Country (state) fixed effects	yes	yes
Year fixed effects	yes	yes
Observations	352	1,127
R-squared	0.905	0.944

Notes: the table presents the estimates of the effect of country-level financial liberalization (column (1)) and state-level bank deregulation (column (2)) on aggregate college enrollment. Exposure denotes the share of production allocated to industries with high needs for finance and strong complementarity. The differential effect measures the relative impact of the reform on countries at the 75th and 25th-percentile of the exposure index. The fraction of variation explained is the ratio between the differential effect across countries and the standard deviation of (log) enrollment, after controlling for fixed effects. Standard errors in parentheses are clustered at the country (column (1)) and state (column (2)) level. ***, **, * denote statistical significance at 1%, 5%, and 10%.

Table 7: Effect of country-level financial liberalization on wage inequality, additional results

	(1) High enforcement countries	(2) Low enforcement countries	(3) Controlling creditor rights reforms
Financial liberalization · EFD	-0.070*** (0.018)	-0.103* (0.052)	-0.082*** (0.025)
Financial liberalization · CSC	-0.009 (0.015)	-0.081* (0.038)	-0.017 (0.027)
Financial liberalization · EFD · CSC	0.162*** (0.042)	0.215 (0.174)	0.166*** (0.044)
Creditor rights reforms · EFD			0.020 (0.013)
Creditor rights reforms · CSC			-0.011 (0.035)
Creditor rights reforms · EFD · CSC			-0.025 (0.062)
Differential effect across industries	2.59%	0.00%	2.66%
Fraction of variation explained	41.14%	0.00%	42.16%
Country×year fixed effects	yes	yes	yes
Country×industry fixed effects	yes	yes	yes
Observations	3990	2985	6975
R-squared	0.935	0.774	0.940

Notes: the table presents additional results for the relationship between country-level financial liberalization and wage inequality. Column (1) includes the subsample of countries with high debt enforcement, column (2) includes countries with low enforcement, and column (3) controls for creditor rights reforms. EFD stands for external financial dependence and CSC for capital-skill complementarity. The differential effect measures the relative impact of the reform on industries at the 75th and 25th-percentile of the product between the EFD and CSC indices. The fraction of variation explained is the ratio between the differential effect across industries and the standard deviation of (log) wage inequality, after controlling for fixed effects. Standard errors in parentheses are clustered at the country level using block-bootstrapping. ***, **, * denote statistical significance at 1%, 5%, and 10%.

Table 8: Effect of country-level financial liberalization on wage inequality, robustness checks

	(1)	(2)	(3)	(4)	(5)
	Binary indices	Asset tangibility	Continuous reform	Kaminsky-Schmukler reform	European countries
Fin Lib · EFD _{Bin}	-0.057*** (0.010)				
Fin Lib · CSC _{Bin}	-0.039*** (0.008)				
Fin Lib · EFD _{Bin} · CSC _{Bin}	0.042*** (0.010)				
Fin Lib · Tang		-0.049*** (0.014)			
Fin Lib · CSC		0.073*** (0.021)			-0.012 (0.034)
Fin Lib · EFD · Tang		-0.367*** (0.079)			
Fin Lib _{Cont} · EFD			-0.243*** (0.042)		
Fin Lib _{Cont} · CSC			-0.030 (0.019)		
Fin Lib _{Cont} · EFD · CSC			0.205*** (0.042)		
Fin Lib _{KS} · EFD				-0.117*** (0.030)	
Fin Lib _{KS} · CSC				-0.005 (0.042)	
Fin Lib _{KS} · EFD · CSC				0.248*** (0.040)	
Fin Lib · EFD					-0.094*** (0.028)
Fin Lib · EFD · CSC					0.178*** (0.050)
Country×year fixed effects	yes	yes	yes	yes	yes
Country×industry fixed effects	yes	yes	yes	yes	yes
Observations	6975	6975	6480	4725	5625
R-squared	0.939	0.939	0.946	0.926	0.942

Notes: the table reports robustness checks for the relationship between country-level financial liberalization and wage inequality. Column (1) uses binary definitions of industry indices, column (2) uses asset tangibility as the industry index of financial vulnerability, column (3) uses the original continuous [Abiad et al. \(2010\)](#) reform index, column (4) uses the [Kaminsky and Schmukler \(2008\)](#) reform index, and column (5) includes only European countries. Standard errors in parentheses are clustered at the country level using block-bootstrapping. ***, **, * denote statistical significance at 1%, 5%, and 10%.

Table 9: Estimated and calibrated structural parameters

Parameter	Description	Country-level reforms	State-level reforms
ψ	Labor flexibility	0.8	2.5
$(\lambda_{s1}, \lambda_{u1})$	Allocative shares sect. 1	(0.25, 0.75)	(0.40, 0.60)
$(\lambda_{s2}, \lambda_{u2})$	Allocative shares sect. 2	(0.30, 0.70)	(0.35, 0.25)
$(\theta_{k1}, \theta_{s1}, \theta_{u1})$	Cost shares sect. 1	(0.82, 0.02, 0.16)	(0.70, 0.10, 0.20)
$(\theta_{k2}, \theta_{s2}, \theta_{u2})$	Cost shares sect. 2	(0.76, 0.10, 0.14)	(0.55, 0.25, 0.20)
$(\sigma_1^{ks}, \sigma_1^{ku}, \sigma_1^{su})$	Elast. substitution sect. 1	(1.10, 1.58, 1.33)	(1.10, 1.58, 1.33)
$(\sigma_2^{ks}, \sigma_2^{ku}, \sigma_2^{su})$	Elast. substitution sect. 2	(1.63, 1.49, 1.09)	(1.63, 1.49, 1.09)
δ	Differential effect on capital	3.3%	11%
$\hat{\theta}$	Size of reform	11.0%	5.1%

Notes: the table depicts the full set of structural parameters used in the structural analysis of the paper, both for the country-level and the state-level analysis. The subset of parameters $\psi, (\lambda_{si}, \lambda_{ui})_{i \in \{1,2\}}, (\theta_{ki}, \theta_{si}, \theta_{ui})_{i \in \{1,2\}}, (\sigma_i^{ks}, \sigma_i^{ku}, \sigma_i^{su})_{i \in \{1,2\}}, \delta$ were directly estimated. The parameter $\hat{\Omega}$ is calibrated in order to match the prediction of the model regarding differential inequality with the reduced form results

A Appendix: Model derivations and proofs

A.1 Log-linearization of model

The model described in section 3 can be solved using the dual approach to two-sector general equilibrium models.²⁷ Since the production functions of each industry $i \in \{1, 2\}$ exhibit constant returns to scale, they may be described by their unit isoquant:

$$f_i(a_{ki}, a_{si}, a_{ui}) = 1,$$

where $a_{ki} = k_i/y_i$, $a_{si} = s_i/y_i$, and $a_{ui} = u_i/y_i$. The full-employment equations (3) and (5) can be therefore re-written as:

$$\begin{aligned} a_{k1}y_1 &= (\theta + \epsilon_1)A \\ a_{k2}y_2 &= (\theta + \epsilon_2)A \\ a_{s1}y_1 + a_{s2}y_2 &= S \\ a_{u1}y_1 + a_{u2}y_2 &= U \end{aligned}$$

These equations can be log-linearized as follows:

$$\begin{aligned} \widehat{a}_{k1} + \widehat{y}_1 &= \delta_1 \widehat{\theta} + \widehat{A} \\ \widehat{a}_{k2} + \widehat{y}_2 &= \delta_2 \widehat{\theta} + \widehat{A} \\ \lambda_{s1} \widehat{y}_1 + \lambda_{s2} \widehat{y}_2 &= \widehat{S} - (\lambda_{s1} \widehat{a}_{s1} + \lambda_{s2} \widehat{a}_{s2}) \\ \lambda_{u1} \widehat{y}_1 + \lambda_{u2} \widehat{y}_2 &= \widehat{U} - (\lambda_{u1} \widehat{a}_{u1} + \lambda_{u2} \widehat{a}_{u2}), \end{aligned} \tag{A.1}$$

where a hat over a variable denotes a percentage change (i.e. $\widehat{x} = \frac{dx}{x}$), $\delta_i = \frac{\theta}{\theta + \epsilon_i}$, and λ_{ji} is the allocative share of factor j employed in industry i (e.g., $\lambda_{s1} = s_1/S$). It is immediate that $\lambda_{j1} + \lambda_{j2} = 1$ for $j \in \{s, u\}$. I normalize $\delta_1 = 1$ so that $\delta_2 = \delta < 1$ represents the differential increase in capital demand across industries.

The zero-profit conditions (6) for each industry i can be re-written as:

$$a_{ki}r_i + a_{si}w_s + a_{ui}w_{ui} = p_i$$

Log-linearizing yields:

$$\theta_{ki} \widehat{a}_{ki} + \theta_{ki} \widehat{r}_i + \theta_{si} \widehat{a}_{si} + \theta_{si} \widehat{w}_s + \theta_{ui} \widehat{a}_{ui} + \theta_{ui} \widehat{w}_{ui} = \widehat{p}_i,$$

²⁷See, for example, chapter 10 of [Bhagwati et al. \(1998\)](#).

where θ_{ji} is the cost share of the factor j employed in industry i (e.g., $\theta_{k1} = r_1 a_{k1}/p_1$). Note that since both production functions exhibit constant returns to scale, $\theta_{ki} + \theta_{si} + \theta_{ui} = 1$. The expression above can be simplified as follows. First, I define the unit cost function for each industry as:

$$c_i(r_i, w_s, w_{ui}) = \min_{a_{ki}, a_{si}, a_{ui}} \{a_{ki}r_i + a_{si}w_s + a_{ui}w_{ui} \quad \text{s.t.} \quad f_i(a_{ki}, a_{si}, a_{ui}) = 1\}$$

The first order conditions of the cost-minimization problem are $\eta \partial f_i / \partial a_{ki} = r_i/p_i$, $\eta \partial f_i / \partial a_{si} = w_s/p_i$, and $\eta \partial f_i / \partial a_{ui} = w_{ui}/p_i$, where η is the Lagrange multiplier of the unit production restriction. In the unit isoquant, $(\partial f_i / \partial a_{ki}) da_{ki} + (\partial f_i / \partial a_{si}) da_{si} + (\partial f_i / \partial a_{ui}) da_{ui} = 0$. Log-linearizing this expression and using the first order conditions yields $\theta_{ki} \widehat{a}_{ki} + \theta_{si} \widehat{a}_{si} + \theta_{ui} \widehat{a}_{ui} = 0$. As a result, the log-linearized zero-profit conditions reduce to:

$$\theta_{ki} \widehat{r}_i + \theta_{si} \widehat{w}_s + \theta_{ui} \widehat{w}_{ui} = \widehat{p}_i \quad (\text{A.2})$$

Next, note that the imperfect labor mobility equation (2) can be re-written as:

$$\frac{a_{u1} y_1}{a_{u2} y_2} = \kappa \left(\frac{w_{u1}}{w_{u2}} \right)^\psi$$

Log-linearizing this equation yields:

$$(\widehat{a}_{u1} - \widehat{a}_{u2}) + (\widehat{y}_1 - \widehat{y}_2) = \psi (\widehat{w}_{u1} - \widehat{w}_{u2}) \quad (\text{A.3})$$

Finally, I derive the optimal factor demands. By Shepard's Lemma, the optimal demands can be written as $a_{ki} = c_i^k(\cdot)$, $a_{si} = c_i^s(\cdot)$, and $a_{ui} = c_i^u(\cdot)$, where $c_i^j(\cdot) = \partial c_i / \partial p_j$ for $j \in \{k, s, u\}$ and p_j is the shorthand notation for the price of factor j . Log-linearizing the system above yields:

$$\begin{aligned} \widehat{a}_{ki} &= \frac{r_i c_i^{kk}}{c_i^k} \widehat{r}_i + \frac{w_{si} c_i^{ks}}{c_i^k} \widehat{w}_s + \frac{w_{ui} c_i^{ku}}{c_i^k} \widehat{w}_{ui} \\ \widehat{a}_{si} &= \frac{r_i c_i^{sk}}{c_i^s} \widehat{r}_i + \frac{w_{si} c_i^{ss}}{c_i^s} \widehat{w}_s + \frac{w_{ui} c_i^{su}}{c_i^s} \widehat{w}_{ui} \\ \widehat{a}_{ui} &= \frac{r_i c_i^{uk}}{c_i^u} \widehat{r}_i + \frac{w_{si} c_i^{us}}{c_i^u} \widehat{w}_s + \frac{w_{ui} c_i^{uu}}{c_i^u} \widehat{w}_{ui}, \end{aligned}$$

where $c_i^{jl}(\cdot) = \partial c_i^j / \partial p_l$ for $j, l \in \{k, s, u\}$. Given that the cost function $c_i(\cdot)$ is linear homogeneous, $c_i^j(\cdot)$ is homogeneous of degree zero in its arguments. Therefore:

$$\begin{aligned} r_i c_i^{kk}(\cdot) + w_s c_i^{ks}(\cdot) + w_{ui} c_i^{ku}(\cdot) &= 0 \\ r_i c_i^{sk}(\cdot) + w_s c_i^{ss}(\cdot) + w_{ui} c_i^{su}(\cdot) &= 0 \\ r_i c_i^{uk}(\cdot) + w_s c_i^{us}(\cdot) + w_{ui} c_i^{uu}(\cdot) &= 0 \end{aligned}$$

The Allen-Uzawa partial elasticity of substitution measures the percentage change in the ratio of the inputs h and m in response to a change in the ratio of the two input prices, holding all other prices (but not all other inputs) and the output quantity constant. As shown by Uzawa (1962), the elasticity can be defined in terms of the cost function as follows:

$$\sigma_i^{hm} = \frac{c_i(\cdot)c_i^{hm}(\cdot)}{c_i^h(\cdot)c_i^m(\cdot)},$$

for $h, m \in \{k, s, u\}$. Using the homogenous-of-degree-zero conditions and the definition of elasticity of substitution, I can re-write the optimal factor demands as:

$$\begin{aligned}\widehat{a}_{ki} &= \theta_{si}\sigma_i^{ks}(\widehat{w}_s - \widehat{r}_i) + \theta_{ui}\sigma_i^{ku}(\widehat{w}_{ui} - \widehat{r}_i) \\ \widehat{a}_{si} &= \theta_{ki}\sigma_i^{ks}(\widehat{r}_i - \widehat{w}_s) + \theta_{ui}\sigma_i^{su}(\widehat{w}_{ui} - \widehat{w}_s) \\ \widehat{a}_{ui} &= \theta_{ki}\sigma_i^{ku}(\widehat{r}_i - \widehat{w}_{ui}) + \theta_{si}\sigma_i^{ku}(\widehat{w}_s - \widehat{w}_{ui})\end{aligned}\tag{A.4}$$

The set of equations (A.1)-(A.2)-(A.3)-(A.4) conform a system of linear equations. I set to zero all changes of exogenous variables with exception of the policy change ($\widehat{A} = \widehat{S} = \widehat{U} = \widehat{p}_1 = \widehat{p}_2 = 0$).

The fact that industry 1 exhibits a stronger degree of CSC than industry 2 means that that $\sigma_1^{ku}/\sigma_1^{ks} > \sigma_2^{ku}/\sigma_2^{ks}$. To simplify the algebra, and without loss of generality, I set $\sigma_2^{ku} = \sigma_2^{ks} = \sigma_2$. In addition, I normalize $\sigma_1^{ks} = 0$ and define $\sigma_1 = \sigma_1^{ku}$. To further simplify the algebra, I also normalize $\sigma_1^{su} = \sigma_2^{su} = 0$.²⁸

The percentage change in wage inequality across industries can be written as:

$$\widehat{(\omega_1/\omega_2)} = (\widehat{w}_s - \widehat{w}_{u1}) - (\widehat{w}_s - \widehat{w}_{u2}) = \widehat{w}_{u1} - \widehat{w}_{u2}$$

After some fairly cumbersome algebra, I can solve the system of equations and obtain a closed-form expression for the change in wage inequality across industries

$$\widehat{(\omega_1/\omega_2)} = \Omega(\cdot)\widehat{\theta},\tag{A.5}$$

where:

$$\Omega(\cdot) = \left(\frac{\theta_{u2}}{\theta_{s2}} - \frac{\theta_{u1}}{\theta_{s1}}\right) \frac{\lambda_{s1} - \delta\lambda_{s2}}{\alpha_1} + \left[\left(\frac{\theta_{u2}}{\theta_{s2}} - \frac{\theta_{u1}}{\theta_{s1}}\right) \frac{\beta_1}{\alpha_1} - \frac{\theta_{k1}}{\theta_{s1}}\right] \xi + \left[\left(\frac{\theta_{k2}}{\theta_{s2}} - \frac{\theta_{k1}}{\theta_{s1}}\right) \zeta\right] + \left(\frac{\theta_{u2}}{\theta_{s2}} - \frac{\theta_{u1}}{\theta_{s1}}\right) \left(\frac{\beta_1}{\alpha_1} \zeta + \frac{\gamma_1}{\alpha_1}\right) \frac{\Theta}{\Lambda} > 0$$

and $\xi = \frac{[(\lambda_{u1} - \delta\lambda_{u2})\alpha_1 - (\lambda_{s1} - \delta\lambda_{s2})\alpha_2]}{\beta_1\alpha_2 - \beta_2\alpha_1}$, $\zeta = \frac{\gamma_2\alpha_1 - \gamma_1\alpha_2}{\beta_1\alpha_2 - \beta_2\alpha_1}$, $\alpha_1 = (\lambda_{s1}\theta_{u1}\sigma_1\theta_{s2} - \lambda_{s2}\theta_{k2}\sigma_2\theta_{u2})/\theta_{s2}$, $\beta_1 = \lambda_{s1}\theta_{u1}\sigma_1$, $\gamma_1 = (\lambda_{s2}\sigma_2\theta_{s2} + \lambda_{s2}\theta_{k2}\sigma_2[\theta_{s2} + \theta_{k2}])/\theta_{s2}$, $\alpha_2 = \lambda_{u1}\theta_{u1}\sigma_1 + \lambda_{u1}\theta_{k1}\sigma_1 + \lambda_{u2}\theta_{k2}\sigma_2$, $\beta_2 = \lambda_{u1}\theta_{u1}\sigma_1 + \lambda_{u1}\theta_{k1}\sigma_1$, $\gamma_2 = \lambda_{u2}\sigma_2 + \lambda_{u2}\theta_{k2}\sigma_2$, $\alpha_3 = (\psi[\theta_{u2}\theta_{s1} - \theta_{u1}\theta_{s2}] + \theta_{u1}\sigma_1\theta_{s2}\theta_{s1} + \theta_{k2}\sigma_2\theta_{u2}\theta_{s1})/\theta_{s2}\theta_{s1}$, $\beta_3 = (\psi\theta_{k1} + \theta_{u1}\sigma_1\theta_{s1})/\theta_{s1}$, and $\gamma_3 = (\psi\theta_{k2} + \sigma_2\theta_{s2} + \theta_{k2}\sigma_2[\theta_{s2} + \theta_{k2}])/\theta_{s2}$.

²⁸These normalizations are only made to simplify the algebra in the proofs of the propositions. The structural analysis of section 8 considers the full range of elasticities.

A.2 Proofs of propositions

Proof of proposition 1. Recall from (A.1) that $\widehat{k}_1 = \widehat{\theta}$ and $\widehat{k}_2 = \delta\widehat{\theta}$. Thus $\widehat{(k_1/k_2)} = (1-\delta)\widehat{\theta}$. Since $\delta < 1$, it is immediate that $\frac{\partial(\widehat{k_1/k_2})}{\partial\widehat{\theta}} > 0$.

Proof of proposition 2. Given that $\Omega(\cdot) > 0$, I get directly from equation (A.5) that $\frac{\partial(\widehat{\omega_1/\omega_2})}{\partial\widehat{\theta}} = \Omega(\cdot) > 0$.

Proof of proposition 3. From the previous proof, I know that $\frac{\partial^2(\widehat{\omega_1/\omega_2})}{\partial\widehat{\theta}\partial\psi} = \frac{\partial\Omega(\cdot)}{\partial\psi}$. Note also that $\frac{\partial\Omega(\cdot)}{\partial\psi} = \frac{\partial\Theta}{\partial\psi}$. Given that $\frac{\partial\alpha_3}{\partial\psi}, \frac{\partial\beta_3}{\partial\psi}, \frac{\partial\gamma_3}{\partial\psi} > 0$, I get that $\frac{\partial\Theta}{\partial\psi}\Lambda(\psi) - \Theta(\psi)\frac{\partial\Lambda}{\partial\psi} > 0$ and therefore $\frac{\partial\Theta}{\partial\psi} > 0$. Hence, $\frac{\partial^2(\widehat{\omega_1/\omega_2})}{\partial\widehat{\theta}\partial\psi} > 0$.

A.4 Derivation of skilled share equation

Assuming that capital is a quasi-fixed factor, the variable cost function of an industry is defined as $c = w_s s + w_u u$. The log of the variable cost function can be approximated to a Translog function by taking a second order Taylor expansion in the logs of output and inputs, yielding:

$$\begin{aligned} \log(c) &= \alpha_0 + \alpha_s \log(w_s) + \alpha_u \log(w_u) + \alpha_k \log(k) + \alpha_y \log(y) + 1/2[\gamma_{ss} \log(w_s)^2 + \gamma_{su} \log(w_s) \log(w_u) \\ &+ \gamma_{us} \log(w_u) \log(w_s) + \gamma_{uu} \log(w_u)^2 + \gamma_{kk} \log(k)^2 + \gamma_{yy} \log(y)^2] + \gamma_{sk} \log(w_s) \log(k) \\ &+ \gamma_{uk} \log(w_u) \log(k) + \gamma_{sy} \log(w_s) \log(y) + \gamma_{uy} \log(w_u) \log(y) + \gamma_{ky} \log(k) \log(y) \end{aligned} \quad (\text{A.6})$$

Due to cost minimizing, the conditional demand for skilled labor can be written using Shepard's Lemma as $s = \frac{\partial c}{\partial w_s}$. It then follows that the share of skilled labor in the variable cost function (i.e. wage bill) can be derived as follows:

$$\mathcal{S} = \frac{w_s s}{c} = \frac{\partial \log(c)}{\partial \log(w_s)} \quad (\text{A.7})$$

Combining equations (A.6) and (A.7) yields the share of skilled labor in the variable cost function as:

$$\mathcal{S} = \alpha_s + \gamma_{ss} \log(w_s) + \gamma_{su} \log(w_u) + \gamma_{sk} \log(k) + \gamma_{sy} \log(y)$$

Linear homogeneity in input prices means that for a fixed level of output total cost increases proportionally when all prices increase proportionally. As a result, $\gamma_{ss} + \gamma_{su} = 0$. Constant returns to scale, on the other hand, implies that $\gamma_{sk} + \gamma_{sy} = 0$. The imposition of linear homogeneity and constant returns to scale yields equation (7) of the main text.

B Appendix: Data details

Countries in sample: Australia, Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Netherlands, Poland, Portugal, Spain, Sweden, and U.K. [Financial liberalization data for the U.K. comes from [Kaminsky and Schmukler \(2008\)](#)].

States in sample: All states except Delaware and South Dakota. Consistent with the literature, I drop these states because the structure of their banking systems was heavily affected by laws that made them centers for the credit card industry.

Countries included in CSC estimation: Australia, Austria, Czech Republic, Denmark, Finland, Germany, Italy, Japan, Korea, Netherlands, Portugal, Slovenia, Sweden, and U.K.

Industries in sample: Manufacturing of wood, manufacturing of coke and refined petroleum, manufacturing of chemicals, manufacturing of rubber and plastics, manufacturing of other non-metallic mineral products, manufacturing of machinery and equipment, construction, sale-maintenance-repair motor vehicles, wholesale trade and commission trade, retail trade, hotels and restaurants, post and telecommunications, real estate activities, education, and health and social work.

Skill levels country-level analysis: Skill levels are defined according to the ISCED one-digit classification. Low skill corresponds to primary or lower secondary education (ISCED 1 or 2), medium skill to upper secondary education (ISCED 3 or 4), and high skill to tertiary education (ISCED 5 or 6).

Time coverage state-level analysis: The coverage begins in 1977 because prior to this year it is difficult to identify state of residence in the data. It ends in 2002 because the composition of industries changed substantially in this year, so any comparison of industries before and after this date is not possible without major adjustments.

Industry classification: I use the ISIC Rev. 3 industry classification of EU-KLEMS. I use standard concordance tables to match the CIC classification used in CPS with the ISIC Rev. 3 classification. I also use standard concordance tables to match the NAICS 1997 classification of COMPUSTAT with the ISIC Rev. 3 classification.

External financial dependence in COMPUSTAT: Capital expenditures correspond to line #128 . Cash flow from operations is defined as cash flow from operations plus changes in

payables minus changes in receivables plus changes in inventories, and is computed as the sum of lines #123, 125, 126, 106, 213, and 217, for format code 7.

Higher education enrollment data: Data on country-level college enrollment comes from the World Development Indicators (WDI) of the World Bank. Data on state-level enrollment is obtained from the Digest of Education Statistics of the National Center for Education Statistics (NECS).

Dates of country-level financial liberalization: Australia: 1988, Austria: 1994, Belgium: 1991, Czech Republic: 1996, Denmark: 1988, Finland: 1988, France: 1987, Germany: 1975, Greece: 1993, Hungary: 1996, Ireland: 1986, Italy: 1993, Japan: 1991, Korea: 1995, Netherlands: 1980, Poland: 1997, Portugal: 1992, Spain: 1989, Sweden: 1986, U.K.: 1981.

Dates of U.S. state-level bank branch deregulation: Alabama: 1981, Alaska: 1960, Arizona: 1960, Arkansas: 1994, California: 1960, Colorado: 1991, Connecticut: 1980, District of Columbia: 1960, Florida: 1988, Georgia: 1983, Hawaii: 1986, Idaho: 1960, Illinois: 1988, Indiana: 1989, Iowa: 1999, Kansas: 1987, Kentucky: 1990, Louisiana: 1988, Maine: 1975, Maryland: 1960, Massachusetts: 1984, Michigan: 1987, Minnesota: 1993, Mississippi: 1986, Missouri: 1990, Montana: 1990, Nebraska: 1985, Nevada: 1960, New Hampshire: 1987, New Jersey: 1977, New Mexico: 1991, New York: 1976, North Carolina: 1960, North Dakota: 1987, Ohio: 1979, Oklahoma: 1988, Oregon: 1985, Pennsylvania: 1982, Rhode Island: 1960, South Carolina: 1960, Tennessee: 1985, Texas: 1988, Utah: 1981, Vermont: 1970, Virginia: 1978, Washington: 1985, West Virginia: 1987, Wisconsin: 1990, Wyoming: 1988.

Cross-country labor market rigidity index: Australia: 0.352, Austria: 0.501, Belgium: 0.513, Czech Republic: 0.521, Denmark: 0.573, Finland: 0.737, France: 0.744, Germany: 0.702, Greece: 0.519, Hungary: 0.377, Ireland: 0.343, Italy: 0.649, Japan: 0.164, Korea: 0.446, Netherlands: 0.726, Poland: 0.639, Portugal: 0.809, Spain: 0.745, Sweden: 0.741, U.K.: 0.282.

States with right-to-work laws: Alabama, Arizona, Arkansas, Kansas, Florida, Georgia, Idaho, Iowa, Kansas, Louisiana, Mississippi, Nebraska, Nevada, North Carolina, North Dakota, Oklahoma, South Carolina, Tennessee, Texas, Utah, Virginia, Wyoming.

Cross-country debt enforcement index: Australia: 0.878, Austria: 0.78, Belgium: 0.908, Czech Republic: 0.407, Denmark: 0.767, Finland: 0.924, France: 0.541, Germany: 0.57, Greece: 0.538, Hungary: 0.467, Ireland: 0.899, Italy: 0.453, Japan: 0.955, Korea: 0.881, Netherlands: 0.949, Poland: 0.697, Portugal: 0.823, Spain: 0.82, Sweden: 0.86, U.K.: 0.923.