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Financial Development and Inequality in the Global Economy

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Abstract

We build a heterogeneous firms model with firm-specific wages and credit frictions to study the role of financial development for inequality in the global economy. If there are many small (non-exporting) firms, better access to external funds reduces wage and profit inequality as well as unemployment. In contrast, if there are many large (exporting) firms, financial development might have opposite effects – especially if trade costs are low. In summary, the implications of financial development for inequality depend on the size distribution of firms and on the costs of exporting. Trade liberalization, however, raises inequality unambiguously.

Keywords: Credit constraints; financial development; inequality; international trade
JEL classification: *F*16; *F*65

I. Introduction

The empirical literature on the implications of financial market development for income inequality has produced a mixed picture. While some studies have shown that financial development leads to less inequality (see, e.g., Clarke *et al.*, 2006; Liang, 2006; Beck *et al.*, 2007), others find that financial development contributes to rising income inequality (see, e.g., Jaumotte *et al.*, 2013; de Haan and Sturm, 2017) – even after controlling for trade openness. We suggest a theoretical model that rationalizes these heterogeneous findings by arguing that international trade and the size distribution of firms might play a crucial role in understanding the link between better access to external finance and income distribution. While financial development raises income inequality in countries with many highly productive (exporting) firms, the opposite is true for economies with relatively more small (non-exporting) firms.

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This topic is highly relevant as recent decades have revealed pronounced developments of financial markets, international trade, and wage inequality, especially within skill groups (see, e.g., Katz and Autor, 1999; Autor *et al.*, 2008).[1] While there has been some effort to link trade integration to wage inequality, the implications of financial development for wage distribution and unemployment are less well understood, especially in the global economy.

Our model features three types of friction to rationalize the stylized facts introduced above. First, moral hazard in credit markets leads to credit rationing. As contracts cannot be written contingent on entrepreneurial effort, lenders demand a sufficiently high entrepreneurial stake in the project to render shirking unattractive. Otherwise, a project fails with certainty and the lender loses the investment. Capital owners are endowed with one unit of assets, but differ in their entrepreneurial skill in running a firm. As higher skill translates into higher total factor productivity and thus higher profits, entrepreneurs of low-productivity firms do not earn a sufficiently high income to credibly commit to diligent behavior. As a consequence, lenders do not grant external finance, causing credit rationing of those firms. In essence, credit frictions affect the distribution of firms by excluding the least productive enterprises from external finance and thus entry. This mechanism is in line with empirical evidence that small firms benefit most from a reduction in credit frictions (e.g., through better investor protection or law enforcement), which we refer to as the source of financial development.[2]

Second, there is a friction in the labor market giving rise to within-group wage inequality. We assume that workers have fairness preferences where firm-specific operating profits serve as the reference income for determining the individual fair wage.[3] Due to firm heterogeneity, more productive firms pay higher wages (e.g., Bayard and Troske, 1999), giving rise to a skill-group-specific wage distribution.[4] As this positive relationship between firm size and firm wages is central to the underlying economic mechanism in the model, it is important to emphasize that this link can also be established by using alternative modeling approaches to labor market frictions, such as,

[1]The ratio of private credit relative to GDP in the US and the UK has increased from a value of around one in the 1980s to around two in recent years. Similar trends are seen for France and Germany, albeit at lower levels (World Bank Global Financial Development Database). World trade has grown about twice as fast as global production since the 1980s (WTO, 2013).

[2]Aghion *et al.* (2007) show that for 16 industrialized and emerging economies "access to finance matters most for the entry of small firms." Further evidence is provided by Beck *et al.* (2005, 2008).

[3]See Akerlof and Yellen (1990).

[4]See Egger and Kreickemeier (2009, 2012) for similar approaches.

e.g., search and matching or assortative matching.[5] The qualitative insights therefore do not crucially depend on the fairness approach to efficiency wages; the empirical labor literature has documented the relevance of rent sharing as a determinant of wage differences between firms (e.g., Blanchflower *et al.*, 1996; Hildreth and Oswald, 1997).[6]

Third, international trade is inhibited by both variable and fixed trade costs. This leads to selection of the most productive companies into exporting (Melitz, 2003). Overall, the model allows us to compare the effects of both trade liberalization and financial development for the distribution of wages and unemployment.

In autarky, financial development leads to firm entry and a lower unemployment rate, but has no effect on the ratio of wages paid by the average firm compared to the least productive firm in our model. In the open economy, in contrast, relative wages respond to financial development because the change in both the number of firms and the share of exporters alters the wage distribution. While better access to external finance exerts ambiguous effects on wage inequality in general, we show that financial development reduces inequality if there are relatively more small (low-productivity) firms. However, financial development amplifies wage inequality if the size distribution of firms is more homogeneous and the costs of exporting are low. This ambiguity is rooted in two effects. First, better access to finance stimulates entry of small firms. *Ceteris paribus*, this broadens the range of productivities and firm-specific wages such that inequality would increase. Second, entry of small firms leads to a reduction in the market shares of incumbent firms and a reduction in the share of exporters, which compresses both the wage schedule and the average wage. The relative size of these effects depends on the prevalence of small versus large firms and the propensity to export. The same result emerges with respect to relative profits.

Looking at trade liberalization, we find that a marginal reduction in trade costs raises wage inequality, profit inequality, and unemployment.[7] The different effects of financial development and trade liberalization stem from differences in firm selection. While financial development leads to higher entry of small firms and a lower share of exporters (Ehrlich and Seidel, 2015), trade liberalization stimulates entry into exporting and reduces the number of firms in one country (Krugman, 1979; Melitz, 2003).

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[5]Examples include Helpman and Itskhoki (2010), Helpman *et al.* (2010), and Sampson (2014).
[6]Further, Howitt (2002) and Bewley (2005) summarize evidence on the fair-wage approach.
[7]This result is well understood from several papers in the trade and labor literature. For example, Egger and Kreickemeier (2012) have shown that a marginal reduction of trade costs raises inequality when the share of exporters is low.

Our paper relates to at least three strands of the literature. First, recent work on the effects of globalization for income inequality concludes that goods market integration tends to raise inequality in several dimensions (e.g., Egger and Kreickemeier, 2009, 2012; Helpman and Itskhoki, 2010; Helpman *et al.*, 2010; Amiti and Davis, 2012; Sampson, 2014), but says nothing about the role of financial market development. Second, the influential finance papers by Galor and Zeira (1993) and Banerjee and Newman (1993) argue that financial development raises the investment opportunities of the poor, exerting an equity-enhancing effect.[8] Our paper deviates from these studies by focusing on firm selection in the global economy as a so-far-unexplored mechanism in this context. Third, a recent and growing body of literature has studied the role of financial frictions for the pattern of international trade (e.g., Manova, 2008, 2013; Schmidt-Eisenlohr, 2013; Antràs and Foley, 2015; Egger and Keuschnigg, 2015), but offers no insights with respect to inequality.

Two papers that consider financial frictions, globalization, and inequality in one framework are Foellmi and Oechslin (2010) and Daisaka *et al.* (2014). The former paper focuses on the effects of trade liberalization in the presence of a financial friction showing that the distribution of wealth affects the distribution of gains from trade within a society. The latter paper shows that, in a small open economy without export selection and with homogeneous wages, financial development stimulates entry of less wealthy entrepreneurs. This reduces both profits and income inequality. Importantly and in contrast to these contributions, our paper provides an explanation for the mixed empirical findings regarding the link between financial market development and income inequality.

The paper is organized as follows. We start with a non-technical overview of the model in Section II. In Section III, we introduce the closed-economy model in detail before we extend the framework to two symmetric countries in Section IV. In Section V, we give our concluding remarks.

II. Overview

Before we start with the formal analysis, we provide a brief overview of the model and introduce some basic notation. There are two identical economies inhabited by two groups of individuals: production workers L possessing one efficiency unit of labor each and risk-neutral capitalists owning one unit of assets A each. Capitalists differ in their innate entrepreneurial skill φ. The economy accommodates two industries: an intermediate goods industry that

[8]Further examples on finance and inequality include Acemoglu and Zilibotti (1997) and Matsuyama (2004).

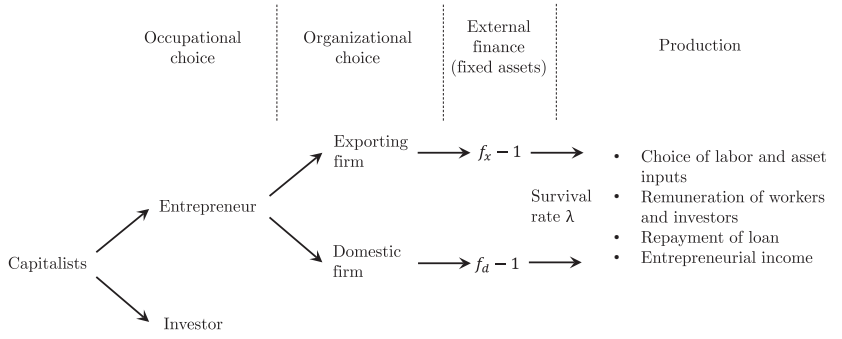

Fig. 1. Timeline

produces unique varieties (q) which are aggregated according to constant elasticity of substitution (CES) technology to the homogeneous final good Y at zero cost, and a final good sector that operates under perfect competition.

Figure 1 illustrates the sequencing of decisions in the model. Capitalists initially choose between a career as an entrepreneur and as an investor. Those with sufficiently high φ find it profitable to run a firm, as their entrepreneurial skill translates into total factor productivity of the company. Entrepreneurs further need to choose the organizational form of their firm. Exporting requires additional fixed costs such that only the most skilled entrepreneurs are able to make profits from serving the foreign market in addition. While domestic firms require f_d units of assets, exporters need f_x units of assets to cover fixed costs for both domestic and exporting operations.

Entrepreneurs need to secure external finance to begin production. However, the asset market is subject to a financial friction because the effort of the entrepreneur is unobservable to third parties and contracts cannot be written contingent on the behavior of the entrepreneur. As firms are only economically viable under diligent behavior, investors require a sufficiently large entrepreneurial income to render shirking unattractive. Thus, the financial friction prevents capitalists with too low φ from entering the market as entrepreneurs. Importantly, credit rationing only occurs at the low end of the productivity distribution because exporters make sufficiently large profits, ensuring diligent behavior. Hence, the financial friction governs firm entry and the export propensity. These selection effects are at the heart of the economic mechanism in our model. A fraction $1 - \lambda$ of those who were successful in securing external finance are hit by a bad shock that prevents them from producing. Surviving firms hire workers and assets as variable inputs, and produce and sell their goods in the respective

market(s). It is important to stress that fair-wage preferences avoid labor market clearing and give rise to firm-specific wages. Finally, all investors are remunerated. In the next section, we introduce the closed-economy version of this model (without organizational choice). We expand the model to the symmetric two-country case in Section IV.

III. The Closed Economy

Endowments, Preferences, and Technology

Consider an economy that is endowed with homogeneous production workers L and capital owners. While each production worker is endowed with one efficiency unit of labor, each capitalist owns one unit of assets A. Capital owners differ in their entrepreneurial skill φ, which for the sake of convenience equals total factor productivity in case they run a firm.

Households derive utility from consuming a homogeneous good Y that serves as the numeraire in our model with its price normalized to one. Further, both production workers and entrepreneurs choose work effort to maximize utility. However, as this choice does not influence welfare in equilibrium, we can ignore it at this point and relegate the details to the respective subsections below. We thus measure welfare in terms of real income.

Turning to the technology side of the economy, we assume that the final good sector operates under perfect competition, assembling its output as a CES aggregate of differentiated intermediate goods according to

$$Y = \left[M^{-(1-\alpha)} \int_{v \in V} q(v)^{\alpha} dv \right]^{1/\alpha}, \quad 0 < \alpha < 1. \tag{1}$$

Aggregation takes place at zero cost. The quantity of the intermediate input variety v is denoted by $q(v)$ and M represents the mass of available intermediates that will be determined endogenously in equilibrium. As intermediates are imperfect substitutes, the parameter α governs the elasticity of substitution $\sigma = 1/(1 - \alpha)$.

Firms manufacture the differentiated intermediates under monopolistic competition. Profit maximization delivers

$$q(v) = \frac{Y}{M} p(v)^{-\sigma}, \tag{2}$$

where $p(v)$ denotes the price of intermediate v and Y can be understood as the total income (revenues) in the economy. Combining assets and labor according to Cobb–Douglas technology then yields $q(\varphi) = \varphi l(\varphi)^{\mu} a(\varphi)^{1-\mu}$, where l and a are firm-specific labor and asset inputs (per efficiency unit). Firms maximize profits by charging a constant mark-up over marginal costs

such that

$$p(\varphi) = \frac{[\gamma w(\varphi)]^{\mu}}{\alpha\varphi}, \tag{3}$$

where $w(\varphi)$ represents wages (in efficiency terms) and γ is the standard Cobb–Douglas cost parameter.[9] Cobb–Douglas technology ensures that the cost shares of labor and capital are constant and given by μ and $1 - \mu$, respectively. Note that we make use of the simplifying assumption that assets and final goods are perfectly substitutable. This implies that the price of assets is pinned down to unity as well and does not show up explicitly in the pricing equation above. This assumption reduces the complexity of expressions substantially. Firm revenues are given by $r(\varphi) = (Y/M)p(\varphi)^{1-\sigma}$, where M denotes the number of firms. As each firm produces one specific variety in monopolistic competition, M also identifies the number of intermediate goods on the market. Due to constant mark-up pricing, operating profits are a constant fraction $1/\sigma$ of revenues.

Labor Market

To introduce firm-specific wages into our model, we follow Egger and Kreickemeier (2012) by assuming that workers have fairness preferences.[10] The idea of the fair wage-effort hypothesis is that there exists an effort norm that we specify as

$$e^n = \min(w/\hat{w}; 1).$$

Setting normal effort to one, workers reduce their effort level proportionally if the wage offer w falls short of the fair wage level $\hat{w}$. It is straightforward to incorporate this notion into the utility function by assuming that deviation from the norm generates costs $\Delta e = -|e^n - e|$, where e is the chosen effort level by workers. Utility maximizing behavior implies $e^n = e$, so these costs become irrelevant in equilibrium (see Kreickemeier and Nelson, 2006).

The fair wage $\hat{w}$ is determined according to

$$\hat{w}(\varphi) = \left[\frac{r(\varphi)}{\sigma}\right]^{\theta} [(1 - U)\bar{w}]^{1-\theta}, \tag{4}$$

where the first part denotes the operating profits of the worker's employer and the second part represents the expected wage income outside the firm (U is the unemployment rate, while $\bar{w}$ is the average wage of the employed

[9]It is given by $\gamma = [\mu/(1 - \mu)]^{1-\mu}[(1 - \mu)/\mu]^{\mu}$.

[10]The approach goes back to the pioneering work by Akerlof and Yellen (1990). Fehr and Falk (1999) as well as Howitt (2002) and Bewley (2005) are relevant sources for evidence on this mechanism.

workers). The parameter $\theta \in (0, 1)$ is referred to as the fair-wage parameter describing the relative importance of each component in the fair-wage equation. Higher values of θ indicate stronger preferences for a more equal split of firm income between entrepreneurs and workers and thus more rigid labor markets.

Relating the fair-wage constraint and revenues of firms with different productivities establishes

$$\frac{r(\varphi_1)}{r(\varphi_2)} = \left(\frac{\varphi_1}{\varphi_2}\right)^{\eta} \quad \text{and} \quad \frac{w(\varphi_1)}{w(\varphi_2)} = \left(\frac{\varphi_1}{\varphi_2}\right)^{\theta\eta},$$

where $\eta \equiv (\sigma - 1)/[1 + \theta\mu(\sigma - 1)]$ reflects the elasticity of firm revenues with respect to firm-level productivity. We observe that firms with higher total factor productivity make higher operating profits and pay higher wages.

Two things need highlighting. First, we need to rationalize why firms do not pay less than the fair wage, especially as some workers are unemployed and those working for less productive firms receive lower wages. This is achieved by assuming that workers reduce their effort proportionally if they are paid less than the fair wage. Thus, firms cannot increase their profits by paying lower wages and we can safely assume that each firm pays the fair wage, so $w = \hat{w}$. This implies that every worker provides normal effort $e = 1$.

Second, all workers would like to be employed at the most productive firm as it offers the highest wages. However, firms have no incentive to accept lower wage bids by workers from low-productivity firms or from unemployed individuals, as any wage below the fair level leads to a proportional decrease in effort, rendering profits unaffected. As we show formally below, in equilibrium, homogeneous production workers accept different wage offers at firms with varying total factor productivity and some will be unemployed as long as $\theta > 0$.

Asset Market

To begin production, firms have to invest $f_d > 1$ units of assets that cannot be financed through cash flows. As each entrepreneur is endowed with one unit herself, $f_d - 1$ units have to be secured on the asset market. However, asymmetric information between borrowers and lenders gives rise to a financial friction in the tradition of Holmstrom and Tirole (1997). Entrepreneurs can choose their effort to run their firm which is unobservable for third parties and cannot be inferred from the firm's profits or revenues. Assuming that projects only have positive net present values when the entrepreneur behaves, lenders have to ensure that shirking is never an appealing option to avoid losses on average.

All firms are subject to bad shocks that imply no revenues from the endeavor – independent of the entrepreneur's behavior. However, diligent behavior reduces the probability of being hit by a bad shock such that the success rate $\lambda_b > 0$ exceeds the success rate under shirking $\lambda_s = 0$. We follow Ju and Wei (2011) in interpreting λ as a property rights protection index.

The incentive compatibility (IC) constraint postulates that the expected income of entrepreneurs from running the firm must be higher under diligent behavior than under shirking. Entrepreneurs receive operating profits minus the repayment to the bank, T, such that

$$\lambda \left[\frac{r(\varphi)}{\sigma} - T \right] \geq b, \tag{IC}$$

where b measures the private benefit of shirking denoted in units of the numeraire and can be regarded as an inverse measure of corporate governance. Thus, the magnitude of this agency cost parameter is determined by the quality of institutions such as investor protection or rule of law. We can infer from equation (IC) that the pledgeable income results as $r(\varphi)/\sigma - b/\lambda$. To ensure participation of investors in the endeavor, the expected pledgeable income has to exceed the credit volume. This ensures that the entrepreneur behaves diligently and generates a sufficiently high income to repay the loan. Formally, this participation constraint is given by

$$\lambda \left[\frac{r(\varphi)}{\sigma} - \frac{b}{\lambda} \right] \geq f_d - 1. \tag{PC}$$

As operating profits are increasing in productivity φ, the condition that identifies the marginal entrepreneur receiving external finance reads

$$\lambda \frac{r(\varphi^*)}{\sigma} = f_d - 1 + b. \tag{5}$$

As managers borrow from a perfectly competitive financial sector, they offer the minimum repayment that meets equation (IC), that is, $T = (f_d - 1)/\lambda$. Hence, the entrepreneur receives the entire surplus if the project is funded. Although entrepreneurs have a choice between diligent behavior and shirking, private benefits are not realized so real income remains the sole determinant in welfare (as claimed in the first subsection of Section III).

Inspection of equation (5) raises the question of whether the financial friction reflected in b differs from the fixed costs f_d. While fixed costs require physical assets, agency costs govern minimum entrepreneurial income in order to satisfy the participation constraint. That is, the income of the entrepreneur has to exceed the private benefit to ensure diligent

behavior.[11] Fixed costs enter market clearing conditions while agency costs affect the selection of firms by imposing a minimum income threshold of borrowers. Both costs thus unfold different effects in the model.

Occupational Choice

Capitalists choose between a career as an investor and a career as an entrepreneur. Due to heterogeneous managerial abilities, the expected income from running a firm varies. For the sake of simplicity, we assume that this ability translates exactly to total factor productivity of the company such that we can identify the indifference condition of capitalists as follows:

$$\lambda \left[\frac{r(\varphi)}{\sigma} - \frac{f_d - 1}{\lambda} \right] \geq 1. \tag{OC}$$

An asset owner founds a firm if her expected profits (left-hand side) exceed the safe return on assets that we have normalized to one (right-hand side).

Equilibrium Factor Allocation

As we are interested in the implications of financial development, that is, a reduction in the agency cost parameter b, we need to ensure that the participation constraint is binding. Comparing equations (PC) and (OC) yields the sufficient condition $b > 1$. This implies that there are capital owners that could earn expected profits larger than one by running a firm, but cannot enter the market due to credit rationing. Their income would be too low to credibly commit to diligent behavior.

We rearrange the participation constraint by using two convenient relationships. First, the sum of operating profits in the intermediate goods industry is given by $(1 - \alpha)Y$ in our case of constant mark-up pricing. Second, we assume that entrepreneurial skills and thus firm productivities follow a Pareto distribution. Specifically, we normalize the scale parameter to unity to obtain $G(\varphi) = 1 - \varphi^{-k}$, where k represents the shape parameter. High values of k indicate high densities of low-productivity firms. We will use the convenient property of Pareto distributions that the average productivity $\tilde{\varphi}$ (determined by $q(\tilde{\varphi}) = Y/M$) is proportional to the productivity cutoff φ^*,

$$\tilde{\varphi} = \left(\frac{k}{k - \eta} \right)^{1/\eta} \varphi^*,$$

[11]The same effect could be achieved by tying the financial friction to variable costs. However, this leads to more complex expressions without gaining additional insights qualitatively.

where we impose the parameter constraint $k > \eta$. With this information at hand, we reformulate the participation constraint in the following way:

$$\frac{(1-\alpha)Y}{M^e}\frac{k-\eta}{k} = f_d - 1 + b, \tag{PC'}$$

where we have substituted the number of firms M by the number of entrants M^e using $M = \lambda M^e$. Further, we can replace Y by exploiting the fact that the return to assets used as variable inputs is given by $A^v = \alpha(1-\mu)Y$.[12]

The resource constraint for assets establishes a second equation linking the total amount of assets used as a variable input, A^v, and the number of entering firms M^e. It is obtained as[13]

$$A^v = A - M^e f_d. \tag{AC}$$

Using both equations delivers

$$A^v = \frac{k(\sigma-1)(f_d-1+b)(1-\mu)}{k(\sigma-1)(f_d-1+b)(1-\mu) + f_d(k-\eta)}A, \tag{6}$$

$$M^e = \frac{k-\eta}{k(\sigma-1)(f_d-1+b)(1-\mu) + f_d(k-\eta)}A. \tag{7}$$

It is immediately apparent that both A^v and M^e are independent of λ while the number of active firms M rises in the quality of property rights protection. An increase in the measure of the agency parameter b lowers M^e and raises A^v. With Pareto-distributed productivity levels, the condition $M^e = [1 - G(\varphi^*)]A = (\varphi^*)^{-k}A$ delivers the cutoff productivity level that is independent of λ and increasing in b. Figure 2 illustrates these relationships. The intuition for these results is straightforward. Financial development (lower b) allows some capitalists, who were willing to enter as entrepreneurs but who were denied external finance, to credibly commit to diligent behavior. The number of entering firms increases and – due to a constant survival rate λ – so does the number of active firms M. As more asset owners choose to found a company, more of this resource is needed for fixed investments and is therefore not available as an input in the production of intermediate goods.

[12]Recall that the return to assets is normalized to unity.

[13]Note that we assume here that capital invested in firms that are hit by a bad shock cannot be used as a variable input in other firms. It is straightforward to relax this assumption so that a fraction of the invested capital can be used for variable investment in other firms. This would not affect results qualitatively (see Ehrlich and Seidel, 2015).

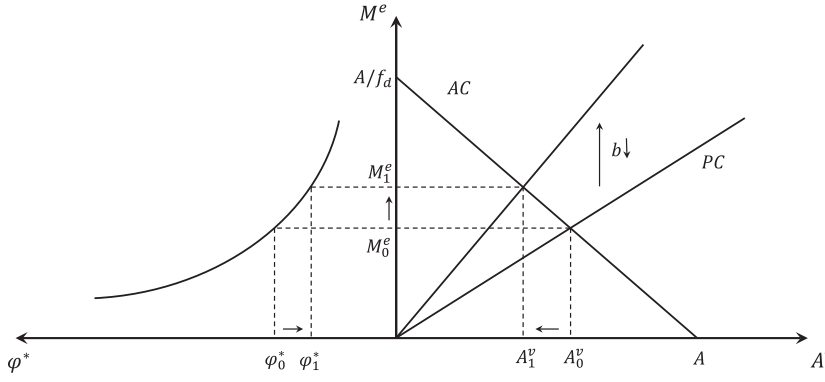

Fig. 2. Credit constraints, entry, and productivity

Inequality

We are now ready to discuss the role of financial development for inequality. To this end, we focus on two measures: wage inequality and the unemployment rate.[14] To capture the effects on the distribution of wages, we compute the average wage of employed workers relative to the wage paid by the marginal (least productive) firm:[15]

$$\frac{\bar{w}}{w(\varphi^*)} = \frac{k - \eta(1-\theta)}{k - \eta}. \tag{8}$$

The unemployment rate is given as

$$U = 1 - \left(\frac{k}{k-\eta}\frac{\mu}{\sigma - 1}\right)^{\theta}\left(\frac{M}{L}\right)^{\theta}\left[\frac{\bar{w}}{w(\varphi^*)}\right]^{-1}, \tag{9}$$

where M needs to be substituted from equation (7) above. The following proposition summarizes the comparative static insights with respect to these measures of inequality.

Proposition 1. *Financial development, that is, lower values of the agency cost parameter b, reduces unemployment while rendering relative wages and relative operating profits unaffected.*

Proof: These findings follow immediately from $\partial M/\partial b < 0$. □

[14]See Egger and Kreickemeier (2009, 2012) for similar approaches in the context of fair wages.
[15]Please refer to the Online Appendix for derivations.

Financial development affects employment through two channels in our model. First, a reduction of agency costs reduces average firm productivity, implying that a given level of output requires more workers. Second, labor demand *ceteris paribus* declines due to a reduction in output. According to Proposition 1, the positive effect dominates unambiguously in the closed economy.

With respect to wage inequality, equation (8) reveals no influence of financial frictions. Intuitively, the entry of new and less productive firms affects the market shares of all firms proportionately, so the ratio of the marginal and the average wage remains constant. This outcome is of course driven by the assumption that firm productivity follows a Pareto distribution and not a general result. Nevertheless, it serves as a helpful reference point for the open economy effects where export selection plays a key role and helps to illustrate the economic mechanism.

IV. The Global Economy

We now extend the model by a second country to study the role of financial frictions in the global economy. For tractability, we assume that both economies are identical with respect to endowments, technology, and market frictions. As each firm produces a unique variety, the two-country model features more intermediate goods compared to the closed economy. With fixed costs of exporting and heterogeneous firms, only a subset of producers will find it profitable to export. Final good producers use both domestically produced and imported varieties to assemble Y according to equation (1). Importantly, international trade is subject to variable transport costs.

In terms of notation, we distinguish between domestic firms, denoted by subscript d, and exporters (that also sell domestically), denoted by subscript x. Due to additional fixed costs for international trade, exporting firms require more assets as fixed investments than domestic firms, that is, $f_x > f_d$. Variable costs are of the iceberg type, implying that $\tau > 1$ units have to be shipped in order for one unit to arrive abroad. Denoting by $r_x(\varphi)$ revenues of an exporting firm from domestic sales, total revenues of an exporter amount to $\Omega_x r_x(\varphi)$ with $1 < 1 + \tau^{1-\sigma} \equiv \Omega_x \leq 2$. We refer to Ω_x as trade freeness.

Credit Constraints across Firm Types

Depending on the firm type, each entrepreneur needs to secure $f_\ell - 1$ units of capital, with $\ell \in \{d, x\}$. The incentive compatibility (IC) constraint in the general form is given by

$$\lambda \left[\frac{\Omega_\ell r_\ell(\varphi)}{\sigma} - T_\ell \right] \geq b$$

with $\Omega_d = 1$. Further, the lender will provide the loan if the manager is able to document a sufficiently high pledgeable income. This participation constraint (PC) requires that

$$\lambda \left[\frac{\Omega_\ell r_\ell(\varphi)}{\sigma} - \frac{b}{\lambda} \right] \geq f_\ell - 1.$$

Again, with a perfectly competitive asset market, each entrepreneur offers a repayment T_ℓ that just satisfies the incentive compatibility constraint, that is, $(f_\ell - 1)/\lambda$. We can rewrite the participation constraint in a similar fashion as in autarky:

$$\lambda \frac{\Omega_\ell r_\ell(\varphi)}{\sigma} = f_\ell - 1 + b.$$

Export Selection

The marginal exporting firm is identified by productivity φ_x^* that ensures equal profits under both organizational forms. Formally, this condition reads

$$\frac{\Omega_x r_x(\varphi_x^*)}{\sigma} - \frac{f_x - 1}{\lambda} = \frac{r_d(\varphi_x^*)}{\sigma} - \frac{f_d - 1}{\lambda}. \tag{10}$$

As operating profits are increasing in productivity φ, it is clear that the marginal exporter requires a higher productivity than the marginal domestic producer to cover the additional export fixed costs. Hence, the marginal exporter always satisfies the participation constraint and is thus not affected by credit rationing (see Ehrlich and Seidel, 2015).

To obtain the export propensity, we express r_x in terms of r_d in equation (10). For firms with identical productivity but different export statuses, from the fair-wage constraint we obtain

$$\frac{w_x}{w_d} = \left(\frac{\Omega_x r_x}{r_d} \right)^\theta,$$

and from revenues

$$\frac{\Omega_x r_x}{r_d} = \Omega_x \left(\frac{w_x}{w_d} \right)^{\mu(1-\sigma)}.$$

Combining both expressions delivers

$$\frac{w_x}{w_d} = \Omega_x^{(\theta\eta)/(\sigma-1)} \qquad \text{and} \qquad \frac{r_x}{r_d} = \Omega_x^{-\mu\theta\eta}.$$

Using $r_d(\varphi_x^*) = (\varphi_x^*/\varphi_d^*)^\eta r_d(\varphi_d^*)$ and the participation constraint $r_d(\varphi_d^*)/\sigma = (f_d - 1 + b)/\lambda$ jointly with the share of exporting firms, $\chi = [1 - G(\varphi_x^*)]/[1 - G(\varphi_d^*)] = (\varphi_d^*/\varphi_x^*)^k$, yields

$$\chi = \left[\Phi^{-1}\left(\Omega_x^{\eta/(\sigma-1)} - 1\right)\right]^{k/\eta}, \tag{11}$$

where $\Phi \equiv (f_x - f_d)/(f_d - 1 + b)$. To ensure $0 \leq \chi \leq 1$, we impose $\Phi > 1$. As expected, χ is increasing in f_d and trade freeness Ω_x and decreasing in export fixed costs f_x. Better access to external finance reduces the share of exporting firms because credit rationing only affects the least productive (non-exporting) firms. With more domestic firms in the market, χ necessarily has to decline.

Equilibrium

To solve the open-economy equilibrium for M^e, A^v, and the domestic cutoff φ_d^*, we reformulate the participation constraint in the same way as in the closed-economy version of the model. We obtain

$$\frac{(1-\alpha)Y}{(1+\chi)M}\frac{k-\eta}{k}\frac{1+\chi}{1+\chi\Phi} = \frac{f_d - 1 + b}{\lambda}, \tag{PCO}$$

where the link between marginal and average productivity is now given by[16]

$$\tilde{\varphi} = \left[\frac{k}{k-\eta}\frac{1+\chi\Phi}{1+\chi}\right]^{1/\eta}\varphi_d^*.$$

Export selection implies that the ratio between productivities of the average and the marginal firm is higher in the open economy compared to the closed economy.

We substitute Y by making use of $A^v = \alpha(1-\mu)Y$ and combine equation (PCO) with the resource constraint for assets,

$$A^v = A - M^e\left[f_d + \chi(f_x - f_d)\right], \tag{ACO}$$

to obtain

$$A^v = \{k(\sigma-1)(1-\mu)[(f_d - 1 + b) + \chi(f_x - f_d)]\}\left\{k(\sigma-1)(1-\mu) \times [(f_d - 1 + b) + \chi(f_x - f_d)] + [f_d + \chi(f_x - f_d)](k-\eta)\right\}^{-1}A, \tag{12}$$

$$M^e = (k-\eta)\left\{k(\sigma-1)(1-\mu) \times [(f_d - 1 + b) + \chi(f_x - f_d)] + [f_d + \chi(f_x - f_d)](k-\eta)\right\}^{-1}A. \tag{13}$$

[16]The derivation of average productivity follows the approach in Egger and Kreickemeier (2012).

The productivity cutoff for a domestic firm is implied by $M^e = (\varphi_d^*)^{-k}A$, while the export cutoff is given by equation (11). In the global economy, financial development (lower b) is associated with both higher firm entry and more active firms, with lower variable asset inputs A^v and a lower productivity cutoff for domestic firms. In contrast, the export cutoff goes up if agency costs decline. Although there is no direct effect on this threshold, financial development affects φ_x^* in general equilibrium. A rise in the number of firms reduces the market share of incumbent firms such that the marginal exporter no longer gains from exporting and turns into a domestic firm. These selection effects will be key for the responses of wage inequality and unemployment.

Inequality

We start by discussing the role of trade liberalization and financial development for wage inequality. In the open economy, this measure is given by[17]

$$\frac{\bar{w}}{w(\varphi_d^*)} = \frac{k-\eta(1-\theta)}{k-\eta}\frac{1+\chi\Phi}{1+\chi^{[k-(1-\theta)\eta]/k}\{\Omega_x^{[(1-\theta)\eta]/(\sigma-1)}-1\}}. \tag{14}$$

As the second term is larger than one, wage inequality is higher in the open economy than in autarky. Intuitively, selection into exporting by the most productive firms leads to a reallocation of revenues and profits between firms (Melitz, 2003). As exporters gain and domestic firms lose, the rent-sharing mechanism translates the increase in the heterogeneity of firm revenues into higher wage inequality. This insight also holds for marginal trade liberalization.[18]

Turning to the effects of financial development, we find that lowering agency costs generally has ambiguous effects on wage inequality in the open economy. First, reducing b allows firm entry at the lower end of the productivity distribution. Notice that these companies pay the lowest wages in the market so $w(\varphi_d^*)$ declines unambiguously. If incumbent firms were not affected by this, this channel would increase wage inequality. However,

[17]Derivations for this section are available in the Online Appendix.

[18]See the Online Appendix for a proof of this result. It is noteworthy that our result differs somewhat from that of Egger and Kreickemeier (2012). While a marginal reduction in trade costs raises wage inequality unambiguously in our model, Egger and Kreickemeier (2012) find that trade liberalization raises wage inequality when the share of exporters is low and reduces it when the share of exporters is high. The key difference is that in our case the outside option of potential entrepreneurs is fixed in terms of the numeraire, while in their paper it is the expected average wage across firms which is endogenously determined in general equilibrium.

incumbent firms are affected by entry as new firms reduce their market shares proportionally. Lower revenues lead to lower firm-specific wages of all firms, which works towards a compression of the wage schedule and an unambiguous reduction in the average wage $\bar{w}$. This constitutes the second effect. Third, the least productive exporting firms no longer find it profitable to serve customers abroad. As the reduction in their market share reduces their operating profits, they can no longer cover export fixed costs. This status change also contributes to a reduction in $\bar{w}$.

For financial development to reduce wage inequality, the decline in average wages has to be stronger than the decline in the marginal wage. It turns out that export selection plays an important role in understanding the effects. Recall that wage inequality was independent of credit constraints in autarky, as financial development led to a proportional reduction in both $w(\varphi_d^*)$ and $\bar{w}$. In the open economy, exporting firms pay a wage premium $w_x/w_d = \Omega^{\theta\eta/\sigma-1}$. Although it is independent of b, the discontinuity in the wage schedule becomes relevant for the distribution of wages if firms change their export status. In summary, wage inequality declines with financial development if the response at the exporter margin is sufficiently large that the average wage declines more than the marginal wage.

What determines the magnitude of the response in χ? First, the shape parameter of the Pareto distribution. If k is low, there are relatively many firms with high productivity, so heterogeneity is high. In that case a reduction of b leads to a relatively strong response in overall firm entry while the change in the export propensity is modest. Thus, the wage of the marginal firm declines more than the average wage, so wage inequality rises. In contrast, if k is high, firms are more homogeneous with a higher density of low productivities. Now a reduction in b leads to relatively low entry of new firms, but a comparably stronger reduction in the share of exporters. In this case, wage inequality declines with financial development.

Further, it can be inferred from (11) that the level of χ also matters for the magnitude of the response to b. We thus identify relative export market fixed costs Φ and trade freeness Ω as two additional determinants for the comparative static effects of financial development for wage inequality. High export market fixed costs and low trade freeness imply a low share of exporters rendering equity-enhancing effects of financial development more likely. The reason is that for an initially low level of exporters a status change of the marginal exporter implies a larger change in the share of exporters compared to a situation where relatively many firms export initially. Recall that χ is increasing in trade freeness Ω and decreasing in relative export fixed costs Φ.

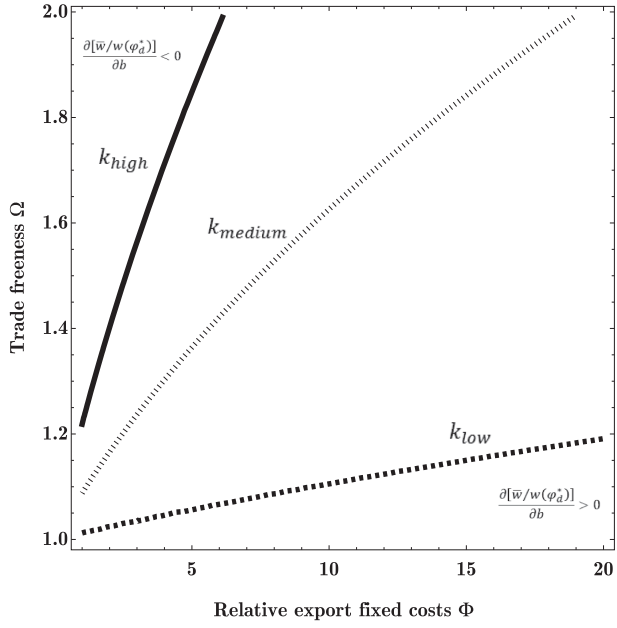

Fig. 3. Wage inequality and financial development
Notes: The k_{high}, k_{medium}, and k_{low} thresholds define $\Omega - \Phi$ combinations where the partial derivative of wage inequality with respect to b is equal to zero for different values of k. Note that k represents the productivity distribution's shape parameter and we have set the elasticity of substitution $\sigma = 3.8$ as in Bernard *et al.* (2003), the labor share $\mu = 0.7$, and the fair-wage constraint $\theta = 0.15$ as in Egger *et al.* (2013). For the $\Omega - \Phi$ combinations below (above) the respective $\partial[\bar{w}/w(\varphi^*)]/\partial b = 0$ lines, financial development reduces (increases) wage inequality.

To illustrate this mechanism, we plot the partial derivative of wage inequality in $\Omega - \Phi$ space for three distinct levels of k. The three functions in Figure 3 indicate the respective combinations of Ω and Φ where the effect of financial development on $\bar{w}/w(\varphi^*)$ is zero. Combinations of Ω and Φ in the bottom-right corner are associated with low levels of χ, while the parameter combinations in the top-left corner imply a high export propensity. The area below the respective curves is associated with an equity-enhancing effect of financial development. As we increase k sufficiently, the positive relationship holds for the entire parameter space.

Our model also allows us to make statements about the inequality of entrepreneurial income that we measure in terms of operating profits of the average firm relative to the marginal (least productive) enterprise. Combining relative firm revenues (that are identical to relative operating

profits) and the expression for average productivity yields

$$\frac{r(\tilde{\varphi})}{r(\varphi_d^*)} = \frac{k}{k-\eta}\frac{1+\chi\Phi}{1+\chi}.$$

In contrast to the closed economy, relative operating profits respond to changes in access to external finance when both countries are linked via trade in goods. As with wage inequality, financial development exerts an ambiguous effect following the same logic as described in the context of wage inequality: financial development reduces inequality of operating profits at lower costs of exporting and under a more homogeneous size distribution of firms. For the sake of brevity, we relegate further discussion to the Appendix. The following proposition summarizes our findings.

Proposition 2. *Financial development reduces wage and profit inequality if the distribution of firm productivities is sufficiently homogeneous (high k). When firm productivities are more heterogeneous (low k), better access to external finance raises wage inequality at high levels of* χ.

Proof: See the Appendix. □

In summary, financial development stimulates entry of small firms which affects the size distribution of firms in general equilibrium. We have highlighted that better access to external finance also affects the export cutoff, giving rise to changes in wage inequality in our model. There is sound evidence that small firms benefit disproportionally from financial development (e.g., Aghion *et al.*, 2007; Beck *et al.*, 2005, 2008) while there is mixed evidence on selection into exporting. While Manova (2013) argues that financial development raises the intensive and extensive export margins, Goldbach and Nitsch (2015) do not find a statistically significant response from German exporting firms to tighter financial constraints.

We now take a closer look at the unemployment rate in the open economy. It is given by

$$U = 1 - \left(\frac{k}{k-\eta}\frac{\mu}{\sigma-1}\right)^{\theta}\left[\frac{M(1+\chi\Phi)}{L}\right]^{\theta}\left[\frac{\bar{w}}{w(\varphi^*)}\right]^{-1}, \tag{15}$$

where M needs to be substituted from above. Two insights are noteworthy. First, we observe that the unemployment rate in the global economy is unambiguously higher than in autarky. Highly productive firms raise their total profits by exporting, so employees in these firms request higher wages (at full effort) due to the rent-sharing mechanism. As a consequence, the unemployment rate goes up. Second, we can show that trade liberalization raises unemployment monotonically.[19]

[19] See the Online Appendix for details.

Turning to the role of financial development, we can build on the previous discussion on wage inequality by adding the additional effect working through $M(1 + \chi\Phi)$. In general, a reduction in agency costs exerts ambiguous effects on the unemployment rate as summarized in the following proposition.

Proposition 3. *When firms are sufficiently homogeneous (high k), financial development reduces the unemployment rate. When firms are more heterogeneous (low k) and the share of exporters is high, financial development exerts opposite effects.*

Proof: See the Appendix. □

Financial development affects unemployment through two channels. First, it is immediately apparent from equation (15) that there is a direct positive link between wage inequality and the unemployment rate. This is intuitive from the fair-wage constraint, because an increase in $\bar{w}$ raises the outside option of workers, implying higher wage claims. For equation (4) to hold, the unemployment rate has to increase. Second, financial development raises the number of firms unambiguously and in turn the labor demand. This effect contributes to a reduction in unemployment. In summary, if better access to external finance reduces wage inequality, then financial development clearly reduces the unemployment rate. If, however, a reduction in b raises wage inequality, the overall effect on the unemployment rate depends on the relative magnitude of each channel.

The theoretical model has identified both the distribution of firm size and the costs of exporting as two central determinants that drive the qualitative impact of financial development on wage inequality and profit inequality in the global economy. While a rigorous empirical validation of these hypotheses exceeds the scope of this paper, we have explored differences in correlations between financial development and income inequality in countries that are more open to international trade compared to those with lower openness. We follow Redding and Venables (2004) in using an indicator for real market potential (RMP) as a proxy for trade openness. The idea is to sum the expenditures of all countries while using bilateral trade costs as weights. This leads to lower values of RMP for countries that are more remote from large markets and thus have a lower propensity to export.

Figure 4 distinguishes between countries with high openness (panel (a)) and countries with low openness to trade (panel (b)). For the former group, we observe a clearly positive relationship between financial development and wage inequality, while panel (b) shows no relationship between these two variables. The findings are in accordance with our theoretical model. High values of RMP correspond to high values of trade freeness Ω or

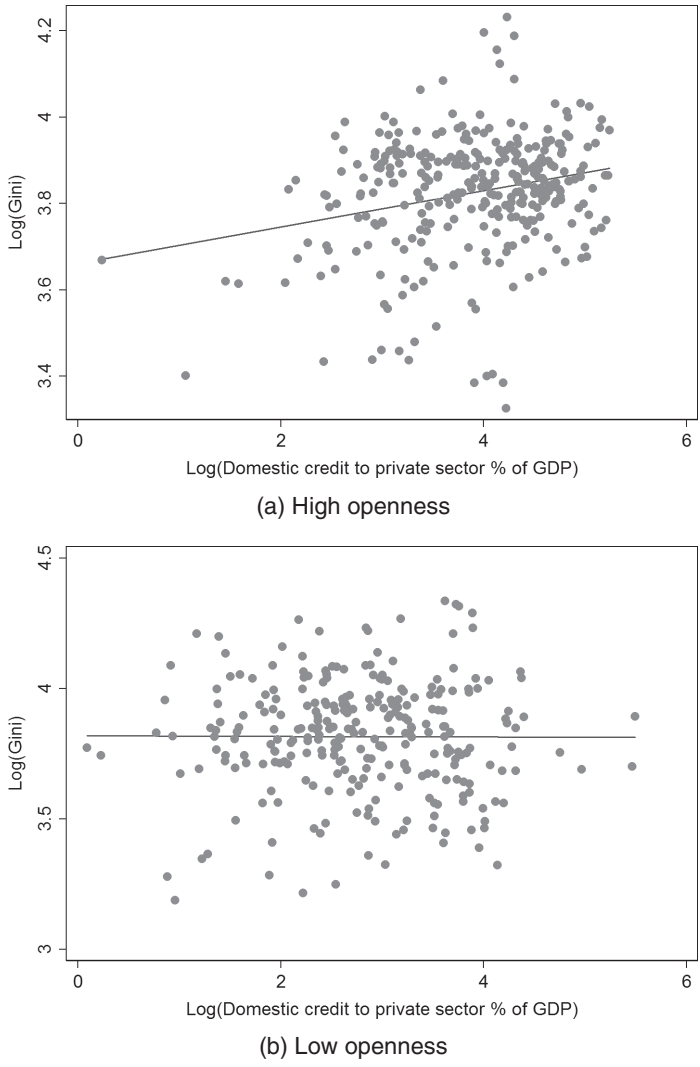

Fig. 4. Financial development and income inequality

Notes: We measure financial development as the ratio of private credit relative to a country's GDP. Openness to trade is defined as the real market potential (Redding and Venables, 2004). The indicator sums the expenditure of countries weighted by the costs of exporting. Panel (a) includes countries with above average trade openness and panel (b) includes countries with below average openness in the respective time periods. The sample contains 137 countries over the time period 1990–2013. We pool computed five-year averages of financial development and Gini indices, with the exception of the last period where we use 2010–2013.

Sources: Word Development Indicators, Standardized World Income Inequality Database, and CEPII.

low levels of relative export fixed costs Φ (see Figure 3) implying a positive link between financial development (lower levels of agency costs b) and income inequality. This points to the role of exposure to global markets for understanding the link between financial development and income inequality.

V. Conclusions

In this paper, we have incorporated financial constraints into a trade model with labor market frictions to compare the effects of financial development with those of trade liberalization. Similarly to insights from several recent papers in the trade and labor literature, trade liberalization can be shown to raise income inequality and unemployment in our model.

Financial development, in contrast, has ambiguous effects for inequality in general. The direction of change crucially depends on the size distribution of firms and on the costs of exporting. If firms are sufficiently homogeneous (a large number of small firms), improving access to external finance reduces income inequality. If firms are more heterogeneous, however, income inequality might increase if the costs of exporting are low. Moreover, we show that financial development has a positive effect on employment if it reduces wage inequality. However, for combinations of exporting costs and firm heterogeneity that imply a positive correlation between financial development and wage inequality, the overall effect on unemployment is ambiguous. In this case the sign of the correlation between financial development and unemployment depends on the amount of firm entry and the degree of wage inequality.

While we are only able to provide stylized facts on the relevance of the theoretical mechanism, future empirical work is needed to identify specific channels through which financial development affects inequality.

Appendix

Proof of Proposition 2: The partial derivative of wage inequality with regard to b is given by

$$\frac{\partial[\bar{w}/w(\varphi^*)]}{\partial b} = \frac{k-\eta(1-\theta)}{k-\eta}\frac{\chi(k-\eta)}{\eta}(f_d-1+b) \times\left[1+\chi^{[k-\eta(1-\theta)]/k}\left\{\Omega_x^{[\eta(1-\theta)]/\sigma-1}-1\right\}\right]^2\Gamma,$$

where

$$\Gamma \equiv \Phi^{1-\theta}\left[\Phi^{\theta}-\left\{\Omega_x^{[\eta(1-\theta)]/(\sigma-1)}-1\right\}\left\{\Phi^{-[(k-\eta)/\eta]}\frac{\eta\theta}{k-\eta}+\frac{k-\eta(1-\theta)}{[\Omega_x^{\eta/(\sigma-1)}-1]^{k/\eta}(k-\eta)}\right\}\left[\Omega_x^{\eta/(\sigma-1)}-1\right]^{[k-\eta(1-\theta)]/\eta}\right].$$

Because the first part of the expression is unambiguously positive, the sign of Γ determines whether $\partial[\bar{w}/w(\varphi^*)]/\partial b \lessgtr 0$.

It is evident that Γ is increasing in Φ. The partial derivative with respect to Ω_x can be written as

$$\begin{aligned}\frac{\partial\Gamma}{\partial\Omega_x} &= \frac{\theta\eta}{\sigma-1}\Phi^{-[(k-\eta)/\eta]}\left[\Omega_x^{\eta/(\sigma-1)}-1\right]^{[k-\eta(1-\theta)]/\eta}\\ &\times\left\{\frac{\eta(1-\theta)}{k-\eta}+\frac{k-\eta(1-\theta)}{k-\eta}\frac{\Omega_x^{[\eta(1-\theta)/(\sigma-1)]}-1}{\Omega_x^{\eta/(\sigma-1)}-1}\right\}\\ &+\frac{k-\eta(1-\theta)}{k-\eta}\frac{\eta(1-\theta)}{\sigma-1}\left[\Omega_x^{\eta/(\sigma-1)}-1\right]^{-(1-\theta)}\Omega_x^{[\eta/(\sigma-1)]-1}\\ &\times\left\{\Omega_x^{-[(\theta\eta)/(\sigma-1)]}-\frac{\Omega_x^{[\eta(1-\theta)/(\sigma-1)]}}{\Omega_x^{\eta/(\sigma-1)}}\right\}>0.\end{aligned}$$

Plugging these results into $(\partial\Gamma/\partial\Phi)d\Phi+(\partial\Gamma/\partial\Omega_x)d\Omega_x=0$ proves that the slopes in Figure 3 must be unambiguously positive.

Moreover, as the sign of Γ determines the partial derivative of wage inequality with regard to b it suffices to show that $\partial\Gamma/\partial k>0$ in order to prove

$$\frac{\partial[\bar{w}/w(\varphi^*)]/\partial b}{\partial k}>0.$$

We can reformulate Γ as

$$\begin{aligned}\Gamma &= \Phi-\Phi^{1-\theta}\left\{\Omega^{[\eta(1-\theta)/(\sigma-1)]}-1\right\}\\ &\times\left[\frac{\eta\theta\Phi^{-[(k-\eta)/\eta]}}{k-\eta}\left\{\Omega^{[\eta(1-\theta)/(\sigma-1)]}-1\right\}^{[k-\eta(1-\theta)]/\eta}\right.\\ &\left.+\frac{k-\eta(1-\theta)}{\{\Omega^{[\eta(1-\theta)/(\sigma-1)]}-1\}^{1-\theta}(k-\eta)}\right].\end{aligned}\tag{A1}$$

As $0<\{\Omega^{[\eta(1-\theta)/(\sigma-1)]}-1\}<1$ the first and second term in square brackets are clearly decreasing in k such that $\partial\Gamma/\partial k>0$ is fulfilled. Accordingly, the

lines in Figure 3 are shifted to the upper left as k increases. For sufficiently high k, $\partial[\bar{w}/w(\varphi^*)]/\partial b > 0$ holds for all $\Omega - \Phi$ combinations.

Turning to relative operating profits, we obtain

$$\frac{\partial[r(\tilde{\varphi})/r(\varphi_d^*)]}{\partial b} = \frac{k}{k-\eta}\frac{(\partial\chi/\partial b)(\Phi-1)+(\partial\Phi/\partial b)\chi(1+\chi)}{(1+\chi)^2}.$$

Notice that $\Phi > 1$, $\partial\chi/\partial b > 0$, and $\partial\Phi/\partial b < 0$. As $\partial\chi/\partial b$ increases in k, the derivative is positive if k is sufficiently large. Figure A1 summarizes this pattern for three different levels of the shape parameter k in the $\Omega - \Phi$ space. □

Proof of Proposition 3: The partial derivative is given by

$$\begin{aligned}\frac{\partial U}{\partial b} &= \left(\frac{k}{k-\eta}\frac{\mu}{\sigma-1}\right)^{\theta}\left\{-\frac{\partial[M(1+\chi\Phi)]^{\theta}}{\partial b}\times\left[\frac{\bar{w}}{w(\varphi^*)}\right]^{-1}\right.\\ &\quad\left.+\frac{\partial[\bar{w}/w(\varphi^*)]}{\partial b}[M(1+\chi\Phi)]^{\theta}\right\}.\end{aligned}$$

The second term in curly brackets can be understood from Proposition 2 and is generally ambiguous. The partial derivative of $[M(1+\chi\Phi)]^{\theta}$ is given by

$$\begin{aligned}\frac{\partial[M(1+\chi\Phi)]^{\theta}}{\partial b} &= \left[\theta M^{\theta}(1+\chi\Phi)^{\theta-1}\right]\left\{k(\sigma-1)(1-\mu)[(f_d-1+b)\right.\\ &\quad\left.+\chi(f_x-f_d)]+[f_d+\chi(f_x-f_d)](k-\eta)\right\}^{-1}\\ &\quad\times\left\{\frac{k-\eta}{\eta}\chi\Phi\left[k(\sigma-1)(1-\mu)(1+\chi\Phi)\right.\right.\\ &\quad\left.+\left(\frac{f_d}{f_d-1+b}+\chi\Phi\right)(k-\eta)\right]\\ &\quad-\left[k(\sigma-1)(1-\mu)\left(1+\frac{k}{\eta}\chi\Phi^2\right)+\frac{k}{\eta}\chi\Phi^2(k-\eta)\right]\\ &\quad\left.\times(1+\chi\Phi)\right\}<0.\end{aligned}$$

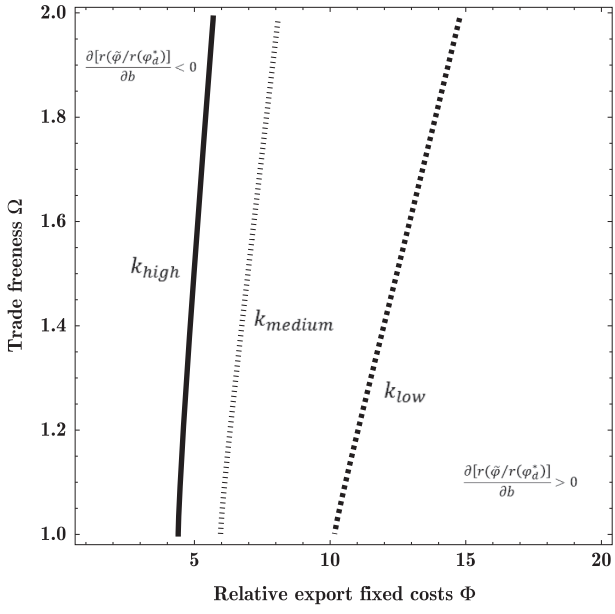

Fig. A1. Inequality of operating profits and financial development
Notes: The k_{high}, k_{medium}, and k_{low} thresholds define $\Omega - \Phi$ combinations where the partial derivative of wage inequality with respect to b is equal to zero for different values of k. Note that k represents the productivity distribution's shape parameter and we have set the elasticity of substitution as $\sigma = 3.8$ as in Bernard *et al.* (2003), the labor share as $\mu = 0.7$, and the fair wage constraint as $\theta = 0.15$ as in Egger *et al.* (2013). For the $\Omega - \Phi$ combinations below (above) the respective $\partial[r(\tilde{\varphi})/r(\varphi_d^*)]/\partial b = 0$ lines financial development reduces (increases) wage inequality.

To see this, we rearrange the expressions in curly brackets to obtain

$$-k(\sigma-1)(1-\mu)(1+\chi\Phi)\left(1+\frac{k}{\eta}\chi\Phi^2-\frac{k-\eta}{\eta}\chi\Phi\right)$$
$$+(k-\eta)\left[\left(\frac{f_d}{f_d-1+b}+\chi\Phi\right)\left(\frac{k-\eta}{\eta}\chi\Phi\right)-\frac{k}{\eta}\chi\Phi^2(1+\chi\Phi)\right].$$

The first row is clearly negative as $\Phi > 1$. The second line is unambiguously negative because $1 + \chi\Phi > f_d/(f_d - 1 + b) + \chi\Phi$ (as $b > 1$) and $(k/\eta)\chi\Phi^2 > [(k-\eta)/\eta]\chi\Phi$. Thus, if $\partial[(\bar{w})/(w(\varphi^*)]/\partial b$ is positive, the effect on unemployment is fostered through firm entry. If $\partial[(\bar{w})/(w(\varphi^*)]/\partial b$ is negative, then the effect on unemployment is mitigated through the positive effect on unemployment from firm entry. □

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Online Appendix

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