MIDDLEMEN MARGINS AND GLOBALIZATION

Abstract

We develop a two-good model of North-South trade where middlemen mediate trade in the good exported by the South to overcome quality assurance problems. Middleman margins and entry into intermediation are endogenously determined by underlying distribution of entrepreneurial ability. Trade liberalization increases inequality in the Southern export sector, as middleman margins increase more than producer prices. Gains from trade are positive in the South and may be negative in the North. Northern intermediaries have an incentive to out-source to suppliers in the South. Such outsourcing reduces inequality in the Southern export sector and raises unskilled wages, with opposite effects in the North.
1 Introduction

Recently there have been growing concerns with quality of both agricultural and light manufactured goods exported by developing countries to Western markets. These highlight problems that developing country exporters face in marketing their products overseas. Quality assurance is provided partly by the presence of trading intermediaries who develop long term relationships with actual producers, and use their brand-name reputations to sell to customers. These quality assurance problems may partly explain the large margins earned by intermediaries, which account for large divergences between producer and consumer prices.

Feenstra [1998] provides an illustration of the magnitude of these margins: a Barbie doll which is sold to US customers for $10 returns 35 cents to Chinese labor, 65 cents covers the cost of materials, and $1 for transportation, profits and overhead in Hong Kong. Mattel, the US retailer earns at least $1 per doll. The remaining covers transportation, marketing, wholesaling and retailing in the U.S. Feenstra and Hanson [2004] show that Hong Kong markups on re-exports of Chinese goods totaled 12% of its GDP, double the share of the entire manufacturing sector. The average markup rate accruing to Hong Kong intermediaries on re-exported Chinese goods was 24%. They show that these markups varied across product categories consistent with information-based theories of intermediation and with the existence of international outsourcing networks.

In the context of primary good exports, Morisset [1998] reports that the price of coffee declined 18% on world markets but increased 240% for consumers in the US between 1975–93. The average margin between US consumer price and world price for beef, coffee, oil, rice, sugar and wheat increased by 83% between 1975–94.

This paper provides a theoretical model of intermediation as a means of overcoming quality assurance problems, and explore the resulting general equilibrium and trade implications in an open economy context. We
extend the model of Biglaiser and Friedman (1994) first to a competitive industry equilibrium context (drawing on Shapiro and Stiglitz [1984]). In this setting, the distribution of firms across varying types (family businesses and intermediaries) and sizes is determined along with allocation of agents across occupations, based on an underlying distribution of entrepreneurial skill (a la Lucas [1978]). The least skilled agents work as unskilled production workers or as suppliers to large intermediaries. Those with intermediate skill form small family firms that produce in-house and sell directly to customers. The most skilled operate large intermediary firms that out-source to suppliers and sell to customers. These firms are characterized by two vertical layers of reputation-based supply relationships (supplier-intermediary and intermediary-customer), with incentive rents arising at each layer. All prices and rents are competitively determined.

We show the model has a unique industry equilibrium for given prices of the final product and given wages of unskilled workers. Comparative static results concerning the effect of rising product prices on the industry equilibrium are derived. These depend in particular on the underlying distribution of entrepreneurial skill. If the distribution has a ‘thick middle’, consumer price increases result in a large output expansion in the sector, driven by a transition of entrepreneurs of middling skill out of family firms into intermediation. The increased entry of new entrepreneurs restricts the growth of intermediary rents as they compete with existing intermediaries for suppliers to out-source to. In such economies there is greater “trickle-down” or “pass-through” of the rising consumer price to the producer (or farm-gate) price. Nevertheless, it is always the case that intermediaries rents rise relative to the rents of family firms, and the latter relative to those of suppliers. In this sense, inequality in the sector in returns to different categories always rises (while the extent of such a rise is smaller in economies with a thick middle class of entrepreneurs).

We subsequently embed this in an open economy general equilibrium
model of North-South trade. We suppose that the South country has a comparative advantage in the good described above (we call this the L-good) with a quality assurance problem. The North has a comparative advantage in the other good (called the C-good) which employs a specific factor (fixed capital) not needed to produce the L-good. ¹ This results from a relative abundance of such capital in the North. The C-sector also employs (unskilled) workers: agents producing in the L-sector have the option of working (as an unskilled worker) in the C-sector. Those unable to start their own firm divide themselves between (unskilled) work in the C-sector and working as a supplier to an intermediary in the L-sector.

To keep the general equilibrium analysis as simple as possible, we assume absence of quality assurance problems in the C-sector. We intend to capture the phenomenon that Southern exports of primary products (e.g., farm goods) or light manufactured products (toys, mechanical devices) appear to be more vulnerable to quality assurance problems and rely on intermediaries more than Northern export goods (high-tech goods, aircraft etc.) This may be the result of a less acute moral hazard problem in production in this sector, owing either to greater automation or standardization compared with production in the L-sector, or greater ease of enforcement of production regulations intended to curb moral hazard.

Coupled with the assumption of identical Cobb-Douglas preferences of customers over their consumption of the C-good and high-quality L-good, the open economy model exhibits a unique competitive equilibrium. If the only feature differentiating North and South countries is the greater abundance of the capital factor specific to the C-sector in the North, in autarky the North country produces more of the C-good and less of the L-good. Lowering trade barriers is thus associated with an expansion of exports of the L-good from the South. This causes intermediary margins to rise in the South, increasing entry into L-sector intermediation, and raising L-sector supplier prices and unskilled wages (with opposite effects in the North). If
the entrepreneurial distribution is thick in the middle, there is greater entry and output expansion, and greater pass-through to producers and unskilled workers. The model this provides one channel by which trade liberalization may be associated with rising inequality in Southern countries, in contrast to predictions of traditional trade theory in a two-country, two-good, two-factor setting. The empirical literature has noted that the effects of trade inequality on inequality and unskilled wages often do not conform to the predictions of those models.  

Moreover some authors have argued that the effects of trade liberalization are context-dependent. Wood [1997] reviews the experiences of many different developing countries and argues there were important differences between Latin America and East Asian countries with respect to trends in wage inequality since the late 1970s.  

Our model may help explain some of this context-dependence: e.g., East Asian economies may have been characterized by a distribution of entrepreneurial ability with a thicker middle compared with Latin American countries, accounting for a larger output response and lower inequality-raising effect of trade liberalization.

The model has some interesting implications concerning welfare effects of trade expansion, as well as effects of international outsourcing. Classical results concerning welfare effects of trade can get overturned in our model. The choice of organizational form by L-sector entrepreneurs involves a pecuniary externality: a switch to intermediation from family businesses creates ‘good jobs’ or incentive rents that benefit hired workers and suppliers. Trade openness results in expanded intermediation in the L-sector in LDCs: hence there is an added welfare benefit in their case, over and above the conventional gains from trade. In DCs by contrast, there is less intermediation as the L-sector shrinks, resulting in a loss of ‘good jobs’. This results in a welfare loss, which could overwhelm traditional gains from trade. In particular, starting from autarky a small lowering of trade barriers must cause aggregate welfare to decline in DCs.
Moreover, the model predicts the effect of international outsourcing on inequality can differ from those of trade liberalization. For instance, in the case where effects on terms of trade are negligible (i.e., countries concerned are small relative to the world economy), we show that outsourcing shrinks middleman margins in LDCs and expands them in DCs. Domestic intermediaries in LDCs shrink, while intermediaries in DCs expand and form multinational enterprises producing in LDCs and selling world-wide. The expansion of supply contracts or ‘good jobs’ in LDCs is accompanied by rising unskilled wages; the opposite happens in DCs.

Alternative theories of outsourcing and effects on inequality have been provided by Antras, Garicano and Rossi-Hansberg [2006], Feenstra and Hanson [1996] and Kremer and Maskin [2003]. Of these, the most closely related to ours is Antras et.al, who develop a model in which agents of heterogeneous abilities sort into hierarchical teams. Their model extends Kremer and Maskin’s model in a variety of directions. Inequality rises in the South in their model owing to the matching of high ability agents in the South with worker teams from the North. The main differences are the following. Our theory includes two goods and thus allows an analysis of effects of trade liberalization as well as international out-sourcing. It also includes an analysis of composition of firms between those based on self-employment and hierarchical contracting. Rents arise owing to moral hazard and reputational effects, rather than matching of heterogeneous agents. These have different implications for effects of outsourcing, which results in factor price equalization in their model but not in ours. Our theory predicts unskilled wages will remain lower in developing countries even in the absence of any impediments to trade or out-sourcing. Moreover, their theory predicts that outsourcing raises inequality in the South, whereas our model predicts the opposite can happen.

Section 2 introduces the model. Section 3 describes the equilibrium of the L-sector and comparative statics with respect to the L-good price.
Section 4 describes the economy-wide equilibrium and the effects of trade liberalization. Section 5 describes the effect of outsourcing. Finally Section 6 concludes.

2 Model

There are two goods: a capital intensive good C, and a labor intensive good L. Good C requires capital and labor to produce; it has a Cobb-Douglas production function \( X_C = L_C^\beta C_C^{1-\beta} \) where \( L_C, C_C \) denote labor and capital inputs respectively. In contrast the production of good L requires only labor. In addition, the production of L involves a moral hazard problem. A unit of good L can be of either high or low quality: one unit of high (resp. low) quality good L requires one (resp. \( z \)) unit of labor, where \( 1 > z > 1/2 \).

The assumption that \( z < 1 \) implies workers will have an incentive to shirk, as production of the low quality good leaves some time \( 1 - z \) available for working at other tasks that would generate income. The assumption that \( z > 1/2 \) (combined with the assumption that each agent inelastically supplies one unit of labor) simplifies the analysis by ensuring that an agent can produce a maximum of one unit of the L-good of either high and low quality.

The country’s factor endowments are given: \( \sigma \) denotes the capital-labor ratio. In the multi-country context, North and South countries will be differentiated only by their relative factor endowments.

An alternative interpretation of capital is that it represents a form of skilled labor. The model can be interpreted in this way, as long as skilled labor is specific to the C-sector. Predictions concerning inequality in the C-sector will then pertain to the skill premium in the C-sector instead of the relative returns to capital and labor in that sector. Since the model will introduce heterogeneity of entrepreneurial ability specific to the L-sector, this interpretation requires a classification of skill along two dimensions: technical skill relevant in the C-sector, and entrepreneurial skill in the L-sector. Technical skill is indivisible: either someone has a high-tech engineering
degree or not. In contrast entrepreneurial skill relevant to management of L-sector firms varies continuously in the population. This interpretation requires the additional assumption that those with technical skill always work as skilled workers in the C-sector (i.e., either they have negligible entrepreneurial talent, or skilled wages in the C-sector are high enough). Those without technical skill can work as unskilled workers in the C-sector, or in the L-sector: their occupational choices will be described by the model. In order to simplify the exposition, however, we revert back to the interpretation of the capital factor as fixed equipment or machinery, rather than human capital specific to the C-sector.

Each agent supplies one unit of labor inelastically: this will be allocated between different occupations. Agents have heterogenous ability in managing a firm in the L sector, represented by parameter $a$, which is the largest firm size (or sales of L good) this agent can manage (akin to the Lucas [1978] theory of firm size distribution). $a$ could also represent access to finance or marketing skill or other key input (such as land) needed to produce the L-good in combination with unskilled labor. There is a given distribution of $a$ in the population, represented by c.d.f. $G(a)$ on the support $[0, \bar{a}]$.

There are two kinds of L-sector firms that sell the L-good to customers: family businesses and retail intermediaries. Family businesses produce the good themselves, and are therefore limited in scale: they can only produce one unit of the good. Intermediaries outsource production to suppliers and encounter agency problems in ensuring high quality supply. 4 But in doing so they can sell more than one unit of the good: their sales volume is limited only by the entrepreneur’s ability $a$. Clearly, only agents with $a > 1$ will prefer to form an intermediary firm rather than family business.

It will be convenient to assume in addition that to run either kind of business, a minimum endowment of ability $\underline{a} > 0$ is required of the entrepreneur. This assumption rules out the possibility of family businesses of arbitrarily small size, and thus ensures the existence of a pool of agents in the economy
(with $a < a_0$) that cannot become entrepreneurs). This assumption is not really needed for the analysis, since reputational factors will endogenously create economies of scale: they will make it difficult for firms of arbitrarily small size to develop a reputation. But it does simplify the analysis considerably. Agents with $a < a_0$ must therefore either work in the C-sector, or as suppliers in the L-sector to some intermediary firm. Agents with $a \geq a_0$ on the other hand can choose either to be an L-supplier, run a family business, or an intermediary firm in the L-sector.

We also seek to avoid complications from the possibility that some agents may mix occupations. In particular, we shall assume that supervision of suppliers takes enough time that an intermediary has no time left over for working in production in either L or C sectors. Hence entrepreneurs must either choose between a family business and becoming an intermediary: they cannot do both (i.e., they cannot produce some of their good themselves and outsource the rest).

The moral hazard problem is that the quality of the L good supplied cannot be observed at point of sale; customers identify quality at the time they consume the good. We assume that low quality good generates no utility at all to customers: they have identical Cobb-Douglas preferences over consumption of the C good and high quality L good. Producing a unit of the low quality L good requires only $z$ units of time of a worker’s time, allowing the remaining $1 - z$ time to be allocated to working in the C sector. If a supplier supplies the good to an intermediary, the latter cannot monitor the quality of the good at the time it is delivered. However the quality will become known later when the good is sold to a customer. The effect of low quality on the intermediary’s reputation is such that the intermediary will design supply contracts so as to ensure that high quality supply is incentive compatible for suppliers.

This requires suppliers to be paid adequate incentive rents. Supplier discipline is provided by the fact that low quality supply will result in ter-
mination of the supplier’s contract (as the intermediary’s reputation will be destroyed). We use a model akin to that of Shapiro and Stiglitz [1984]. Unskilled agents with low entrepreneurial ability will queue for supply contracts or ‘good jobs’ in the L-sector with intermediary firms. The market for unskilled work in the C-sector pays no rents, and therefore always clears. Those winning a supply contract get paid a price higher than C-sector unskilled wages. So renewal of these contracts conditional on maintenance of reputation provides the incentives for them to provide a high quality L-good. A random fraction $h$ of these supply contracts get terminated for exogenous reasons, and are filled from those queuing for these contracts.

The incentive problem also arises in marketing. A family business has a short-term incentive to supply a low quality L-good, in order to divert time to working in the C-sector. An intermediary has a similar incentive to procure a low-quality L-good at a lower supply price than the prevailing rent-inclusive supply price for a high-quality L-good. Selling a low quality good will result in destruction of the firm’s reputation. We assume that any firm selling a low quality good to any consumer loses its brand-name reputation thereafter, and can never sell the L-good ever again to any consumer. The entrepreneur must subsequently work either as an unskilled worker in C sector, or as a supplier in the L sector. To overcome the moral hazard problem, intermediaries and family business must also earn incentive rents. For intermediaries, these rents take the form of middleman margins, the gap between the retail price and the price they pay their suppliers.

The trade-off between family businesses and intermediaries then reduces to the following. Family businesses are characterized by only one layer of incentive rents, the result of a single moral hazard problem in marketing. Intermediaries are characterized by two layers of incentive rents, owing to the double moral hazard problem in production as well as marketing. Intermediaries incur higher procurement or production costs than family businesses. This causes their moral hazard problem in marketing to be more
severe than for family businesses. This is compensated by the larger scale on which they can operate. The consequences of a destroyed reputation for the entrepreneur are the same irrespective of ability, being condemned thereafter to the status of a supplier/worker for ever thereafter. A larger scale of business of an intermediary implies that the latter has more to lose from destruction of reputation. This creates a natural reputational scale economy. The intermediary form of business organization is therefore preferred by entrepreneurs with large ability, while family businesses are selected by those of lower ability.

3 L sector equilibrium

We start by describing equilibrium firm composition and middleman margins in the L sector, taking output prices and wages as given. In the next section we shall embed this in a general equilibrium model where these prices and wages will be endogenously determined.

We use the following notation. The price of the C-good $P_C$ is normalized to unity. $P_L$ denotes good $L$ price, and $w$ the unskilled wage in sector $C$. The price paid by intermediaries to suppliers $\tilde{P}_L$ will be endogenously determined in the L-sector equilibrium.

The relevant incentive constraints will involve the ratio of L-good prices to the wage $p \equiv P_L/w$ and $\tilde{p} \equiv \tilde{P}_L/w$. Let $V_u$ denote the present value utility of an agent who does not run a business and does not have a supply contract currently. $V_h$ will denote the present value utility of an agent that does have a supply contract. Also, let $v_u \equiv V_u/w$ and $v_h \equiv V_h/w$. $\delta \in (0, 1)$ denotes the discount factor of all agents.
3.1 Incentive Constraints

The incentive constraint pertaining to the marketing moral hazard problem for a family business is:

\[ \frac{p}{1 - \delta} \geq p + (1 - z) + \delta v_u. \]

The left-hand-side is the present value profit of supplying a high quality unit. The right-hand-side is the value of supplying a low quality unit, which allows the producer to supplement earnings by working part-time in the C-sector, but results in a loss of reputation from the next period onwards. This constraint reduces to

\[ p - (1 - \delta) v_u \geq (1 - \delta)(1 - z)/\delta. \]

In the discussion that follows, we shall assume this constraint is satisfied; Proposition 1 will describe the consequences of it not being satisfied.

The corresponding incentive constraint for an intermediary with ability \( a \) is:

\[ \frac{(p - \tilde{p}) a}{1 - \delta} \geq (p - z)a + \delta v_u. \]

which reduces to

\[ p - \tilde{p} - (1 - \delta)v_u/a \geq (1 - \delta)(\tilde{p} - z)/\delta. \]

This follows from the fact that it is optimal for an intermediary to expand scale of production to the maximum level \( a \). Moreover, if the intermediary wants to sell low quality goods to customers, it can be procured at cost \( z \) from suppliers.

In order to provide suppliers the incentive to supply high quality goods, \( \tilde{p} > 1 \). This implies that an intermediary incurs higher procurement cost of high quality than the production cost of a family business. It then gains more immediately by deviating to low-quality supply. Therefore for an entrepreneur with \( a = 1 \), the incentive constraint is more difficult to satisfy.
compared with a family business. At unit scale of production, family businesses are more trustworthy.

This disadvantage of intermediation is countered at higher values of $a$: larger volumes means that an intermediary has more to lose in terms of future profitability by losing reputation. This implies there is a minimum scale $a_R$ at which intermediaries’ incentive constraint is satisfied: the solution to

$$p - \hat{p} - (1 - \delta)v_u/a_R = (1 - \delta)(\hat{p} - z)/\delta,$$

if

$$p - \hat{p} - (1 - \delta)v_u/\bar{a} > (1 - \delta)(\hat{p} - z)/\delta.$$  

Otherwise, intermediaries cannot operate at any scale and we can set $a_R = \bar{a}$.

The relative profitability of the two forms of business also depends on the entrepreneur’s ability: higher ability translates into higher scale and profits for intermediaries. The minimum ability at which an agent prefers to become an intermediary rather than operate a family business is given by $\hat{a} = \frac{p}{\bar{p} - \bar{p}}$.

Define $a^* \equiv \max\{\underline{a}, \hat{a}, a_R\}$. An agent with ability $a \geq \underline{a}$ will become an intermediary if and only if $a \geq a^*$.

Agents with $a < \underline{a}$ will search for supply contracts with intermediaries in the L-sector, and work in the C-sector until they are successful in securing a supply contract.

Agents with ability between $\underline{a}$ and $a^*$ will prefer to operate a family business than become a supplier to some intermediary. This follows from the fact that $p > \bar{p}$ in order to ensure that the incentive constraint for intermediaries is satisfied.

Therefore in the case that prices are such that the incentive constraint for family business is satisfied, the occupational pattern will be:

(i) those above $a^*$ become intermediaries

(ii) those between $\underline{a}$ and $a^*$ will run a family business,
(iii) those below $a$ will either become suppliers of the $L$ good to intermediaries, or work in the C sector

Now turn to incentives of suppliers. As in Shapiro-Stiglitz [1984], any existing supply contract is terminated for exogenous reasons with probability $h$, creating scope for new supply contracts to be filled by those looking for such contracts. Contracts are also terminated if a supplier provided a low quality item, since the corresponding intermediary’s reputation will be destroyed. Supplier incentives are provided by these termination threats, combined with incentive rents. Owing to these rents, agents with $a$ below $a$ will prefer to be a supplier in L sector than work in C sector. Supply contracts will therefore have to be rationed: there will be more low-$a$ agents looking for such contracts than the number of such contracts actually offered by intermediaries.

In the Shapiro-Stiglitz equilibrium, all intermediaries offer suppliers the lowest supply price consistent with their incentive to provide high quality:

$$\hat{p} = z + \frac{1 - z}{\delta(1 - h)(1 - \phi)},$$

where $\phi$ is the probability that any supplier without a contract can find a new supply contract with a intermediary in any given period.

The corresponding value $V_u$ of a worker in the C-sector is calculated from the following simultaneous equations for value of having and not having a supply contract for a low-$a$ agent:

$$V_h = \hat{p}_L + \delta[(1 - h)V_h + hV_u]$$

$$V_u = \phi V_h + (1 - \phi)[w + \delta V_u]$$

In addition, the lowest supply price at which supplier’s incentive constraint is met is given by

$$\hat{p}_L = (1 - \delta)V_u + \frac{(1 - \delta(1 - h))(1 - z)}{\delta(1 - h)}w,$$
Solving, we obtain:

\[
\hat{P}_L = w[z + \frac{1 - z}{\delta(1 - h)(1 - \phi)}].
\]

\[
(1 - \delta)V_u = \hat{P}_L - \frac{(1 - \delta(1 - h))(1 - z)}{\delta(1 - h)}w
\]

\[
(1 - \delta)V_h = \hat{P}_L - \frac{h(1 - z)}{1 - h}w
\]

Dividing through by \( w \), we obtain

\[
\tilde{p} = z + \frac{1 - z}{\delta(1 - h)(1 - \phi)}
\]

\[
(1 - \delta)v_u = \tilde{p} - \frac{1 - \delta(1 - h)}{\delta(1 - h)}(1 - z)
\]

\[
(1 - \delta)v_h = \tilde{p} - \frac{h(1 - z)}{(1 - h)}
\]

Define the ‘tightness’ \( k \) of the market for supply contracts to be the ratio of offered supply contracts (i.e., scale of output of intermediary sector \( \int_{\bar{a}}^{\bar{a}} adG(a) \)) to the set of low-\( a \) agents seeking supply contracts:

\[
k \equiv \frac{\int_{\bar{a}}^{\bar{a}} adG(a)}{G(a)}
\]

This determines \( \phi \):

\[
\phi(k) = \frac{hk}{(h - 1)k + 1}.
\]

The industry equilibrium is constructed as follows, taking \( p \) as given. Start with a given \( k \), find corresponding \( \phi(k) \), supply price \( \tilde{p}(k) \), value of working in the C-sector \( v_u(k) \), intermediary threshold \( a^*(p, k) \equiv \max\{a, \frac{p}{p - \tilde{p}(k)}, a_R(p, k)\} \), which in turn determines

\[
k'(p, k) \equiv \frac{\int_{a^*(p,k)}^{\bar{a}} adG(a)}{G(a)}
\]

and finally we impose the fixed point requirement:

\[
k'(p, k) = k.
\]
Note that $\phi(k), \tilde{p}(k), v_u(k)$ are increasing; hence $a_R(p,k)$ is non-decreasing in $k$, and so is $a^*(p,k)$ non-decreasing in $k$. Therefore the number of supply contracts offered $\int_{a^*(p,k)}^{A} adG(a)$ is non-increasing, and $k'(p,k)$ is non-increasing in $k$. This implies that a fixed point $k(p)$ if it exists, is unique: denote this by $k(p)$.

Since higher $p$ raises middleman margins for given $k$, it makes the incentive constraint for intermediaries easier to satisfy at any given $a$. It also increases relative profitability of intermediation over family business, so $a^*(p,k)$ is non-increasing in $p$, implying that $k(p)$ is non-decreasing.

Intuitively, higher $p$ raises size of the intermediary sector, increasing scale of production of the L good (as intermediaries operate at a larger scale than family businesses). This raises demand for supply contracts, and the tightness in the market for supply contracts. This in turn raises supplier price $\tilde{p}$, and $\phi$, number of supply contracts or ‘good jobs’ — the key trickle-down mechanism in the model.

We summarize preceding observations and also settle question of existence of equilibrium in the L-sector.

**Proposition 1** There is a unique L-sector equilibrium, for any given $p \equiv \frac{p_k}{w}$. This equilibrium is described as follows. Define $p_F(k)$ and $p_R(k)$, minimum output prices (relative to the wage rate) that allow incentive constraints of family businesses and intermediaries (at $\bar{a}$) to be satisfied:

$$p_F(k) \equiv (1 - \delta)v_u(k) + (1 - \delta)(1 - z)/\delta$$

and

$$p_R(k) \equiv \frac{(1 - \delta)(\tilde{p}(k) - z)}{\delta} + \tilde{p}(k) + 1/\bar{a}$$

Then:

(a) If $p < p_F(0) \equiv 1 + \frac{1-\delta}{\delta}(1 - z)$ the L sector does not operate, aggregate supply of the L good is $X_L(p) = 0$ and $L_C(p)$, supply of labor in the C sector, is $(1 - \sigma)$. 

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(b) If $p_F(0) \leq p \leq \max\{p_R(0), \tilde{p}(0)\tilde{a}/(\tilde{a} - 1)\}$, only family businesses operate: all agents with $a < \underline{a}$ work in the C-sector, and others operate family businesses. Here $X_L(p) = (1 - \sigma)(1 - G(\underline{a}))$ and $L_C(p) = (1 - \sigma)G(\underline{a})$.

(c) If $p > \max\{p_R(0), \tilde{p}(0)\tilde{a}/(\tilde{a} - 1)\}$, family businesses and intermediary firms co-exist: all agents with $a < \underline{a}$ work as suppliers or C-sector workers; those with $a$ between $\underline{a}$ and $a^*(k_F(p), p)$ operate family businesses, and all those with a above $a^*(k_F(p), p)$ operate intermediary firms (where $k_F(p)$ denotes the unique fixed point of $k'(p, k) = k$). In this region $X_L(p) = (1 - \sigma)[G(a^*(k_F(p), p)) - G(\underline{a}) + \int_{a^*(k_F(p), p)}^{\tilde{a}} a dG(a)]$ and $L_C(p) = (1 - \sigma)(1 - k_F(p))G(\underline{a})$.

The equilibrium is depicted in Figure 1. For prices below $p_F(0)$, the L-sector shuts down as the incentive constraints cannot be satisfied for either kind of firm for any value of $k$. When $p \geq p_F(0)$, the incentive constraint for family business is satisfied at $k = 0$. If $p$ is less than $\max\{p_R(0), \tilde{p}(0)\tilde{a}/(\tilde{a} - 1)\}$ at the same time, there cannot be any intermediaries, either because their incentive constraints are not satisfied, or they are less profitable than a family business. In this price range, $k$ will equal 0. Hence only family businesses will function. Once $p$ is at or above $\max\{p_R(0), \tilde{p}(0)\tilde{a}/(\tilde{a} - 1)\}$, intermediaries enter. Then family businesses and intermediaries co-exist. As $p$ rises within this range, the threshold ability for an intermediary falls, and some family businesses switch to intermediation. This is accompanied by expansion of output of the sector, since intermediaries operate at larger scales than family businesses.

3.2 Comparative Statics of L-sector equilibrium

The interesting region corresponds to where intermediaries operate. Here we can work out comparative statics of an increase in $p$ on intermediary margins and inequality within the L-sector. We work out effects on returns.
relative to $w$, the returns from working in the C-sector. As we shall show later, an increase in $p$ will cause the C-sector wage $w$ to rise, so the result below implies an increase in absolute returns in the L-sector as well.

**Proposition 2** Consider $p$ above $\max\{p_R(0), \bar{p}(0)\bar{a}/(\bar{a} - 1)\}$ where intermediary firms operate. Suppose $p$ increases. Then relative to $w$:

(i) both supply price $\tilde{p}$ and middleman margin $p - \tilde{p}$ increase, but the proportionate increase in the latter is higher (so the intermediary markup rate $1 - \frac{\bar{p}}{p}$ increases);

(ii) $a^*$ falls, i.e., some family businesses convert to intermediation, increasing both average firm size and $k$, the tightness in the market for supply contracts;

(iii) The increase in supplier returns ($\Delta \tilde{p}$) is less than the increase in returns of family businesses ($\Delta p$), which in turn is less than the increase in returns ($\Delta [(p - \tilde{p})a]$) of any intermediary with $a \geq a^*(k_F(p), p)$.

The change in earning patterns across different ability levels is depicted in Figure 2. Earning inequality within the L-sector increases in the sense that higher ability agents obtain higher increases in returns. The supply price rises, making suppliers better off. But this increase is less than the rise in the consumer price of the L-good, since middleman margins rise (which we may recall from Proposition 1 occurs as the price rise of the L-good induces greater entry into intermediation). The supply response of the L-good sector to the price rise involves a set of agents with intermediate abilities switching from the family business form to intermediation. This requires middleman margins to rise. Which in turn limits the trickle down of the price increase to suppliers, and implies that earnings of family businesses rise more than that of the suppliers. The rise in the middleman markup rate $(p - \tilde{p})/p$ ensures that the returns of family businesses in turn rise less than those of incumbent intermediaries.
It is also interesting to note the role of the ability distribution $G(.)$ in determining the response of the L-sector to a rise in $p$. Let $k_F(p)$ be denoted by $k(p)$ from now on. Note that in equilibrium $\hat{p}(p) = \hat{p}(k(p))$, implying that
\[
\frac{\partial \hat{p}}{\partial p} = \frac{1}{(1 - h)} \phi'(k(p))k'(p)
\]
which reduces to
\[
\frac{\partial \hat{p}}{\partial p} = \frac{1}{1 - h} \frac{h}{[1 - (1 - h)k(p)]^2} A^*(p)\left[-A^{*'}(p)\right] \frac{g(A^*(p))}{G(a)}
\]
where $A^*(p)$ denotes the equilibrium ability threshold $a^*(k(p),p)$ for intermediation, and $g(.)$ denotes the density of $G$.

Therefore $g(A^*(p)) = 0$ implies that $\hat{p}$ will not increase at all when $p$ increases: then there is no new entry into the intermediary sector. This is the case where the distribution of $a$ is polarized into a high region and a low region, and $A^*$ falls in between these two regions. The size distribution of firms is polarized between a set of large intermediary firms, and another set of small family businesses, with no entry or exit between these two sectors. The increased consumer price of the L-good is translated entirely into an increase in the middleman margin, with no trickle-down to suppliers at all. Trickle-down requires an increase in the demand for suppliers from intermediaries, and therefore increased entry into intermediation. There must be enough middle sized firms that move out of the family business sector into the intermediary sector.

Another distributional effect is interesting, which may correspond to the Latin America-East Asia distinction. Increased supply of public schooling could be associated with a larger fraction of poor (i.e., low-$a$) agents able to move into the skilled occupation in the C sector. The extreme version of this is where public schooling provides C-sector skills only to a fraction of agents with ability below $a_\perp$. This corresponds to a rise in $\sigma$ and a fall in $G(a)$, while the density above $a_\perp$ is unaffected. This causes $k(p)$ function to shift upwards, raising equilibrium $\hat{p}(p) = \hat{p}(k(p))$, and thus lowering middleman margins.
The effect on the marginal ‘pass-through’ rate \( \frac{\partial \tilde{p}}{\partial p} \) is however difficult to sign. Note also that the effect of a mean-preserving increase in spread of \( a \) is also difficult to assess, as this increases both the demand for and supply of suppliers in the L-sector.

4 General Equilibrium

We start with the autarkic economy. Let \( X_C, X_L \) denote the aggregate per capita supply of C and L goods respectively. We shall use the C-good as numeraire. We have seen above that the L-sector equilibrium depends only on \( p \equiv \frac{P_L}{w} \); hence \( X_L = X_L(p) \). \( p \) also determines supply of labor \( L_C(p) \) to the C sector, and therefore

\[
X_C(p) = L_C(p)^\beta \sigma^{1-\beta}
\]

The aggregate income of the economy is:

\[
Y(p, P_L) \equiv X_C(p) + P_L X_L(p)
\]

Let \( \alpha_L \) denote the constant expenditure share of consumers for the L good. The condition for the L market to clear is:

\[
\alpha_L Y(p, P_L)/P_L = X_L(p).
\]

Equation (1) implies the market clearing condition (3) reduces to

\[
\alpha_L \frac{L_C(p)^\beta \sigma^{1-\beta}}{P_L} - (1 - \alpha_L) X_L(p) = 0.
\]

We can solve for \( P_L \) as a function of \( p \) from the condition that wage in C sector \( w \equiv \frac{P_L}{p} \) equals marginal product:

\[
P_L = p^{\frac{1}{\beta}} \left[ \frac{\sigma}{L_C(p)} \right]^{1-\beta}.
\]

Inserting (5) into (4), we obtain the condition for equilibrium in the autarkic economy in terms of \( p \) alone:

\[
\alpha_L \frac{Y(p, P_L)}{P_L} - X_L(p) = \frac{\alpha_L L_C(p)}{p} - (1 - \alpha_L) X_L(p) = 0.
\]
This presumes that the $p$ that solves (6) exceeds $p_F(0)$, so that the family business sector operates in the L-sector. This requires the condition that

$$\frac{\alpha_L L_C(p_F(0))}{p_F(0)} > (1 - \alpha_L) X_L(p_F(0)). \quad (7)$$

It is easily verified that this reduces to the condition

$$\frac{\alpha_L}{1 - \alpha_L} \frac{G(a)}{1 - G(a)} > \beta [\delta + (1 - \delta)(1 - z)]/\delta. \quad (8)$$

Note that given Cobb-Douglas preferences of consumers, the L-sector must deliver positive output in equilibrium. When (8) is violated, the equilibrium will involve $p = p_F(0)$ and rationing of family business firms: a positive fraction of entrepreneurs with $a$ above $a_0$ will function as family businesses, just enough to meet consumer demand at $p = p_F(0) \equiv 1 + \frac{1 - \delta}{\delta}(1 - z)$.\footnote{Note finally that competitive equilibrium is unique because $L_C(p)$ is decreasing in $p$, while $X_L(p)$ is nondecreasing.}

**Proposition 3** Consider the autarkic economy. There is a unique competitive equilibrium. When (8) holds, $p$ is obtained from solving (6); otherwise $p = p_F(0) \equiv 1 + \frac{1 - \delta}{\delta}(1 - z)$, supply in the L good sector is rationed and output is demand-determined. Given the equilibrium $p$, $P_L$ is obtained from (5). The equilibrium $p$ is independent of $\sigma$, while $P_L$ is increasing in $\sigma$.

This result implies the following differences across countries in autarky. Suppose there are two countries N and S, identical in all respects, except that N has a higher capital-labor ratio: $\sigma^N > \sigma^S$. Then in autarky, $p$ is the same in N and S, so is the composition of L sector between different types of firms. Suppliers in the L-sector receive a higher price $P_L$ in N, and wages in the C-sector $w \equiv \frac{P_L}{p}$ are also higher.

Country S will have a comparative advantage in the L good: if trade barriers fall, S will tend to export the L good and import the C good. We now turn to the effects of trade.
4.1 Open Economy: Effects of Trade Liberalization

Now suppose trade barriers disappear altogether between countries N and S. We shall compare the free trade outcome with the autarkic outcomes in the two countries, noting that similar results obtain concerning a small reduction in trade barriers.

Define national income in country $i$:

$$ Y^i(p^i, P_L) \equiv X^i_C(p^i) + P_L X^i_L(p^i). \quad (9) $$

Then the market clearing condition with free trade is

$$ \alpha_L \left[ Y^S(p^S, P_L) + Y^N(p^N, P_L) \right]/P_L = X^S_L(p^S) + X^N_L(p^N) \quad (10) $$

where

$$ P_L = p^S \beta \left( \sigma^S/L^S_C(p^S) \right)^{1-\beta} = p^N \beta \left( \sigma^N/L^N_C(p^N) \right)^{1-\beta}. \quad (11) $$

To solve for free trade equilibrium, invert (11) to obtain $p^i(p^i, P_L)$ which is decreasing in $\sigma^i$ and increasing in $P_L$. Then insert this in (10) to obtain an equation in $P_L$ alone:

$$ \frac{\alpha_L}{\beta} \left[ \frac{L^S_C(p^S, P_L)}{p(\sigma^S, P_L)} + \frac{L^N_C(p^N, P_L)}{p(\sigma^N, P_L)} \right] - (1-\alpha_L) \left[ X^S_L(p(\sigma^S, P_L)) + X^N_L(p(\sigma^N, P_L)) \right] = 0 \quad (12) $$

As $P_L$ increases, $p(\sigma^i, P_L)$ increases, $L^i_C/p^i$ falls in both countries, while aggregate production of the L good is nondecreasing. Hence there is a unique free trade equilibrium; existence follows from arguments similar to the autarky case.

Note also that

$$ \frac{\alpha_L}{\beta} \left[ \frac{L^i_C(p(\sigma^i, P_L))}{p(\sigma^i, P_L)} \right] - (1-\alpha_L) X^i_L(p(\sigma^i, P_L)) $$

is decreasing in $P_L$, hence the equilibrium $P_L$ with free trade will be intermediate between the corresponding autarkic values:

$$ P^S_A < P^F_L < P^N_A. $$
Using (11), it follows that trade causes $p$ (and therefore $k$, whenever the intermediary sector is operating) to rise in $S$, and fall in $N$. Hence output of $L$ expands in $S$, contracts in $N$, because $S$ exports the $L$ good to $N$. Conversely the $C$ sector will expand in $N$ (as $L_C$ increases owing to the fall in $p$), shrink in $S$, as it will be imported by the latter.

Movement of unskilled workers into the $L$ sector in $S$ owing to the expansion in exports will shrink supply of unskilled workers to the $C$ sector, which will induce a rise in wages ($w^{S,F} > w^{S,A}$) in $S$, just as predicted by the Stolper-Samuelson theorem. However, full factor price equalization does not obtain, because

$$w^{S,F} = \frac{P^F_L}{P^{S,F}_L} \equiv \frac{P^F_L}{p(\sigma^S, P^F_L)} < \frac{P^F_L}{p(\sigma^N, P^F_L)} \equiv w^{N,F}.$$ 

Neither are supply prices for the $L$ good equalized across countries. Recall that $\tilde{p}_L \equiv \hat{p}_L$, the proportion of the consumer price that is ‘passed-through’ to suppliers in the $L$ sector, is decreasing in $p$ whenever the intermediary sector is operating. In autarky $p$ was equalized across $N$ and $S$; with trade it increased in $S$ and fell in $N$. Therefore middleman margins rise in $S$ and fall in $N$ as a result of trade. Earnings inequality (measured by the skill premium, the ratio of returns to agents in different occupations) increases in country $S$ as a result of trade. As explained in the previous section, the extent to which this happens depends partly on the thickness of the ability distribution around the equilibrium threshold. Without a thick middle class of entrepreneurs that enter intermediation in the $L$-sector as a result of increased export demand, export prices rise and these are not passed on to suppliers. In this case trade liberalization does not generate a large output response, and causes the skill premium to rise sharply.

Summarizing the above discussion:

**Proposition 4** There is a unique competitive equilibrium with free trade. Country $S$ exports the $L$ good and imports the $C$ good. Effects of trade in country $S$ are the following (with opposite effects in country $N$): $p$, $w$, $\tilde{p}_L$, 

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\( \phi, X_L \) increase, \( L_C, X_C \) decreases. Middleman margins rise in \( S \) and fall in \( N \); the margin is higher in country \( S \). Free trade does not lead to full equalization of unskilled wages or supplier prices across countries: they are both lower in \( S \). A larger fraction of agents in \( S \) operate intermediary firms \( (a^* \) is lower). Another implication of higher middleman margins in \( S \) as a result of free trade is that suppliers are paid less in \( S \) (since trade equalizes the consumer price of \( L \) across countries). Hence middlemen in country \( N \) have an incentive to out-source to suppliers in \( S \). We shall consider the implications of outsourcing in the next section.

### 4.2 Welfare Effects of Trade

We now study the welfare effects of trade. Aggregate real income in a country equals per capita income, deflated by the cost of living index: \( Y(p, P_L)/P_L^{\alpha_L} \). Trade affects welfare through changes in both \( P_L \) and \( p \). The conventional gains from trade concern the effect of a change in \( P_L \), which has an effect proportional to net exports of \( L \) good:

\[
\frac{\partial W(p, P_L)}{\partial P_L} = \frac{1}{P_L^{\alpha_L}} [X_L(p) - \alpha_L Y(p, P_L)/P_L].
\]

The effect of a change in \( p \) is the novel feature of this model, representing the ‘good job’ effect, operating through the change in the composition of \( L \) sector

\[
\frac{\partial W(p, P_L)}{\partial p} = \frac{1}{P_L^{\alpha_L}} [P_L X_L'(p) + X_C'(p)].
\]

Now

\[
X_C(p) = [(1 - \sigma)(1 - k(p))G(a)]^\beta \sigma^{1-\beta}
\]

and

\[
X_L(p) = (1 - \sigma)[G(a^*(k(p), p)) - G(a) + \int_{a^*(k(p), p)}^{\delta} adG(a)]
\]
Let \( \frac{da^*}{dp} \) denote \( \frac{\partial a^*}{\partial k} k'(p) + \frac{\partial a^*}{\partial p} \). Note from the definition of \( k(p) = \int a^*(k(p),p) \frac{adG(a)}{G(a)} \) that

\[
k'(p) = -a^* g(a^*) \frac{da^*}{G(a)} dp
\]

Hence

\[
P_L X_L'(p) + X_C'(p) = P_L (1 - \sigma)(a^* - 1)g(a^*)[-\frac{da^*}{dp}] - \frac{P_L}{p} k'(p)G(a)(1 - \sigma)
\]

Using the expression above for \( k'(p) \), this reduces to

\[
(1 - \sigma) \frac{P_L}{p} g(a^*)[-\frac{da^*}{dp}][(a^* - 1)p - a^*]
\]

which equals

\[
(1 - \sigma)wg(a^*)[-\frac{da^*}{dp}][(a^* - 1)p - a^*].
\]

Note that \( \frac{dc}{dp} \equiv g(a^*)[-\frac{da^*}{dp}] \) is the effect of additional entry into the intermediary sector on output produced by this sector. The term \( [(a^* - 1)p - a^*] \) measures the effect on aggregate income (relative to the wage rate):

\[
(a^* - 1)p - a^* = (p - \tilde{p})a^* - p + (\tilde{p} - 1)a^*
\]

the sum of: (i) incremental profits \([ (p - \tilde{p})a^* ] - p \) earned by the marginal entrepreneur with ability \( a^* \) switching from family to intermediary business, and (ii) additional rents \((\tilde{p} - 1)a^* \) generated for suppliers as a result. This income effect must be positive, because the former component is non-negative: the marginal entrepreneur cannot be worse off from switching. And the latter component is strictly positive, owing to supplier incentive rents. If the participation constraint vis-a-vis family business form was binding, the first component must be zero. If instead the incentive constraint was binding \( a^* = a_R \), it is also positive. In either case, entrepreneurs ignore the positive externality upon supplier rents created by their decision to enter the intermediary sector. This is the key externality associated with creation of ‘good jobs’, appearing also in earlier work on efficiency wages (Shapiro-Stiglitz [1984], Bulow-Summers [1986]). Competitive equilibria typically
involve too few good jobs. This externality causes additional welfare effects from trade, which are positive for $S$ and negative for $N$.

Summarizing:

**Proposition 5** Consider the effects of trade liberalization on welfare in country $i = N, S$, measured by per capita income deflated by consumer price index: $W(p, P_L) = \frac{Y(p, P_L)}{P_L^i}$. In addition to conventional gains from trade, there is an added welfare effect which is positive (resp. negative) if the intermediary sector grows (resp. shrinks), arising from the pecuniary externality of the intermediary sector on rents of suppliers (the ‘good job’ effect). Owing to trade liberalization, this added welfare effect is positive for $S$ and negative for $N$. Starting from autarky, the effects of small expansion of trade is negative for $N$, and positive for $S$.

The last result follows from the fact that starting with autarky, conventional gains from small amount of trade are second-order. Hence the marginal welfare effect of trade equals the marginal ‘good job’ effect, positive in $S$ and negative in $N$.

### 5 International Out-Sourcing

With free trade in goods alone, supplier prices are lower in $S$, creating incentives for intermediaries in $N$ to out-source to suppliers in $S$. Alternatively, if agents with $a$ below $a^*$ are workers, and intermediaries are capitalists that hire them, capitalists in $N$ have an incentive to shift their factories to $S$ to hire workers there, the phenomenon of direct foreign investment.

We now describe the effect of full integration of the market for supply contracts in the L sector, assuming free trade throughout. We shall refer to free-trade–cum–out-sourcing as *globalization*, and use superscript $G$ to denote this, whereas outcomes with free trade alone will be denoted by the superscript $F$. We shall continue to assume that workers are not free to move across countries.
The equilibrium conditions with out-sourcing have to be modified as follows. Let $\gamma^i, i = N, S$ denote the fraction of country $i$ intermediaries that source suppliers in country $i$, while the remaining proportion $1 - \gamma^i$ source suppliers in the other country. These correspond to mixed strategies employed by intermediaries, and we assume the law of large numbers operates.

Then the ‘tightness’ of the market for supply contracts in country $i$ is given by

$$ k^i = \frac{(1 - \gamma^j) \int_{a^*_j}^{\tilde{a}_j} adG(a)(1 - \sigma^j) + \gamma^i \int_{a^*_i}^{\tilde{a}_i} adG(a)(1 - \sigma^i)}{(1 - \sigma^j)G(\tilde{a}_j)(1 - \sigma^i)G(\tilde{a}_i)}. $$

The probability $\phi^i$ of a C-sector worker switching into an L-sector supply contractor, and the supply price $\tilde{p}^i$ continue to be described by the same functions of the tightness of the respective contract markets. Moreover, the C-sector wage is determined as before:

$$ w^i = \beta \left[ \frac{\sigma^i}{L^i_{C}(p^i)} \right]^{1 - \beta}. $$

With unrestricted international out-sourcing, supply prices must get equalized across countries, provided the market is active in both countries. Otherwise the market could close down entirely in one country and be characterized by a higher supply price than the other. If the market closes down in some country, it must be in country $N$. The precise conditions for this to happen can be derived from the underlying parameters of the model (e.g., if the endowment of unskilled labor relative to skilled labor between $N$ and $S$ is sufficiently large). In what follows we ignore this corner case, and focus on the case where the market is active in both countries. It can be checked that all our results derived below will carry over to the corner case as well.

**Lemma 1** An equilibrium with unrestricted international out-sourcing must involve $w^S < w^N$ and $\phi^S > \phi^N$.

**Proof.** Suppose otherwise: $w^S \geq w^N$. Since

$$ \tilde{P}^i_L = w^i \left[ z + \frac{1 - z}{\delta(1 - h)(1 - \phi^i)} \right] $$

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equalization of supply prices across countries implies that $\phi^S \leq \phi^N$. This implies $k^S \leq k^N$, and therefore

$$L_C^S(p^S) \equiv (1 - \sigma^S)(1 - k^S)G(a) > (1 - \sigma^N)(1 - k^N)G(a) \equiv L_C^N(p^N)$$

which in turn implies that

$$w^S \equiv \left[ \frac{\sigma^S}{L_C^S(p^S)} \right]^{1-\beta} < \left[ \frac{\sigma^N}{L_C^N(p^N)} \right]^{1-\beta} \equiv w^N$$

a contradiction. □

Hence wages must continue to be lower in country $S$, despite international outsourcing. For if wages were perfectly equalized, the probability of a C-sector worker securing an L-sector supply contract must be the same in both countries. Then the division of agents with $a$ below $a$ between the C-sector and the L-sector would be the same. Since country $N$ has a larger capital endowment, this implies a higher capital-labor proportion in the C-sector, and a higher wage rate in $N$.

The equilibrium with full globalization differs from that under free trade alone in two specific ways, described in parts (b) and (c) of the following result.

**Proposition 6** With free trade and international outsourcing of supply contracts:

(a) wages are lower in the $S$ country; $w^S < w^N$, while a larger fraction of potential suppliers obtain supply contracts in $S$: $k^S > k^N$;

(b) middleman margins are equalized across $S$ and $N$; and

(c) the threshold for intermediary firms is not lower in $S$: $(a^*)^N \leq (a^*)^S$

Part (b) follows from the fact that international outsourcing equalizes the supply price of the L-good, while free trade equalizes the consumer price: therefore middleman margins must be equal. Whereas with free trade alone,
margins were higher in country S. This suggests that international outsourcing results in a fall in the middleman margin in S and a corresponding rise in N, an issue discussed further below.

The intuition underlying result (c) is the following. Since wages are lower in S, equalization of supplier prices with international outsourcing implies that incentive rents for suppliers must be higher in S. This weakens the incentive role of loss of reputation for intermediaries. Therefore the ability threshold for firms to enter intermediation is higher in the S country. This is also in contrast to the case of free trade alone, where country S was characterized by a higher fraction of firms in the L-sector that were intermediaries. It suggests that international outsourcing causes the intermediary sector to shrink in S and expand in N.

We turn finally to the question of effects of international outsourcing, by comparing the globalization with the free-trade-alone outcome. As the preceding discussion suggests, one would expect international outsourcing to increase tightness in the supplier market in S and lower it in N, as intermediaries in N out-source to S suppliers. This should raise the supply price and wage rate in S and lower them in N. Therefore inequality (i.e., the skill premium) should fall in S and rise in N — the opposite of effects of trade. Moreover, the fraction of L-sector firms engaged in intermediation should increase in N, and fall in S.

However, a complication is that international outsourcing would also affect terms of trade (i.e, $P_L$). So we confine attention to the case of outsourcing between two small countries which trade with the rest of the world at a fixed price $P^W_L$. In this case, we can confirm that the intuition above is correct:

**Proposition 7** Suppose countries S and N are small relative to the world market, and trade freely in both goods so $P_L$ is fixed. Then outsourcing between N and S will cause $k^S$, $w^S$, $\phi^S$, $\tilde{P}^S_L$ to increase, and $k^N$, $w^N$, $\phi^N$, $\tilde{P}^N_L$ to decrease: i.e., middleman margins, intermediation and inequality within
the L-sector will rise in country N and fall in country S.

6 Conclusion

We have developed a model of intermediation in the export sector of less
developed countries, as a means of overcoming quality assurance problems
vis-a-vis customers. The moral hazard problem is overcome via brand-name
reputations of intermediaries, who out-source production to suppliers. Both
suppliers and intermediaries are subject to moral hazard problems, and earn
incentive rents. The division of rents is competitively determined, driven by
entry decisions of entrepreneurs into intermediation.

The model raise a number of questions for empirical research. The key
assumption of the model was that intermediation and quality assurance
problems are more severe in the products exported by LDCs. The model
also generated various predictions of effects of trade liberalization and in-
ternational out-sourcing, which could be empirically tested. In particular,
effects of trade and out-sourcing on inequality (measured by the skill pre-
mium) and middlemen margins tend to be dissimilar: in LDCs trade raises
inequality by raising middleman margins, while out-sourcing reduces them.
Conversely, in developed countries trade openness reduces middleman mar-
gins, while out-sourcing raises them.

It will also be interesting to empirically explore the relation of effects of
globalization in developing countries to patterns of entry into intermedia-
tion, which may in turn be related to regulatory frameworks and underlying
distortions in financial markets. The model suggests that out-sourcing will
raise inequality in developed countries, as it reduces producer prices, un-
skilled wages and ‘good jobs’ (i.e., supplier contracts with incentive rents in
the L-sector), while raising profits of intermediaries that become multi-
national enterprises offshoring their supply contracts to poor countries. 8

Our model implies that a developing country where growth and employ-
ment effects of trade liberalization are sluggish owing to a slow rate of entry
into intermediation, could obtain a large boost if it opens doors to outsourcing to its suppliers by multinationals from developed countries. Conversely countries with fast entry into intermediation obtain a larger output expansion effect from trade liberalization, and in such countries suppliers obtain a larger share of the gains from trade. The higher supply prices in such countries implies that the incentive of developed country multinationals to out-source or move their operations to those countries are smaller. Across developing countries, one could therefore witness a negative association between benefits from trade liberalization and from direct foreign investment.

Finally, a number of questions on the theoretical side need to be addressed in future. More definite results concerning effects of international outsourcing are needed. Extensions of the model to a context where both sectors involve intermediation, and to a multi-country context, would be interesting to explore.
APPENDIX: Proofs

Proof of Proposition 1 We start by noting the following results which are useful for later analysis:

- If $a_R(p, k) < \bar{a}$, it is decreasing in $p$ and increasing in $k$.
- $\tilde{p}(k), (1 - \delta)v_u(k)$ and $(1 - \delta)v_h(k)$ are strictly increasing and strictly convex in $k$.
- $\tilde{p}(k) > (1 - \delta)v_h(k) > (1 - \delta)v_u(k)$ and $(1 - \delta)v_u(0) = 1$.
- Define $a^* = a^*(k, p) = \max\{a, \frac{p}{p - \tilde{p}(k)}, a_R(p, k)\}$
  If $a^* \in (a, \bar{a})$, it is decreasing in $p$ and increasing in $k$.
- Define $a^{**} = a^{**}(k, p) = \max\{a, a_R(p, k)\}$
  If $a^{**} \in (a, \bar{a})$, it is decreasing in $p$ and increasing in $k$.

It is easy to show that

$$p_F(0) = 1 + (1 - \delta)(1 - z)/\delta < \frac{(1 - \delta)(\tilde{p}(0) - z)}{\delta} + \tilde{p}(0) + 1/\bar{a} = p_R(0).$$

Define $k_F(p)$ as $k$ which satisfies

$$k = \frac{\int_{\alpha(k,p)}^{\bar{a}} adG(a)}{G(\bar{a})}.$$

Define $k_R(p)$ as $k$ which satisfies

$$k = \frac{\int_{\alpha^{**}(k,p)}^{\bar{a}} adG(a)}{G(\alpha^{**}(k,p))}.$$

Such $k_F(p)$ and $k_R(p)$ are well-defined, since the right hand sides of the above equations map $[0, 1]$ continuously into $[0, \infty)$; $a^*(k, p)$ and $a^{**}(k, p)$ are continuous and non-decreasing in $k$ and converges to $\bar{a}$ as $k$ goes to one.

Some additional results which will be useful shortly:
(i) \( k_F(p) \) is increasing in the region of \( p \) where \( a^*(k_F(p), p) \in (a, \bar{a}) \). \( k_R(p) \) is increasing in the region of \( p \) where \( a^{**}(k_R(p), p) \in (a, \bar{a}) \).

(ii) \( a^*(k_F(p), p) \) and \( a^{**}(k_R(p), p) \) are decreasing in \( p \) in the region where \( a^*(k_F(p), p) \in (a, \bar{a}) \) and \( a^{**}(k_R(p), p) \in (a, \bar{a}) \).

(iii) \( p - \bar{p}(k_F(p)) \) and \( p - \bar{p}(k_R(p)) \) are increasing in \( p \).

To show (iii), note that whenever \( a_R(k_F(p), p) = a^*(k_F(p), p) \)

\[
p - \bar{p}(k_F(p)) = (1 - \delta)[v_u(k_F(p))/a_R(k_F(p), p) + \bar{p}(k_F(p)) - z]/\delta.
\]

Since \( v_u(k_F(p)) \) and \( \bar{p}(k_F(p)) \) are increasing in \( p \), and \( a_R(k_F(p), p) \) is decreasing in \( p \), the right hand side is increasing in \( p \).

Consider alternately \( p \) where \( a^*(k_F(p), p) = \frac{p}{p - m(k_F(p))} \),

\[
p - \bar{p}(k_F(p)) = p/a^*(k_F(p), p).
\]

The left hand side is increasing in \( p \), since \( a^*(k_F(p), p) \) is decreasing in \( p \).

For \( p \) such that \( a^*(k_F(p), p) = \bar{a} \), clearly \( p - \bar{p}(k_F(p)) = p - \bar{p}(0) \) is increasing in \( p \). A similar argument establishes that \( p - \bar{p}(k_R(p)) \) is increasing in \( p \).

We now consider different regions for \( p \):

(1) \( p < p_F(0) \)

In this case, \( [p - (1 - \delta)v_u(0)] < (1 - \delta)(1 - z)/\delta \) and

\[
p - \bar{p}(0) - (1 - \delta)v_u(0)/\bar{a} \leq (1 - \delta)(\bar{p}(0) - z)/\delta,
\]

and the incentive constraints for family business and intermediary are not satisfied. Then there cannot be any supply of good \( L \), and we have \( X_L(p) = 0, L_C(p) = 1 - \sigma \).

(2) \( p_F(0) \leq p \leq \max\{p_R(0), \bar{p}(0)\bar{a}/(\bar{a} - 1)\} \)
In this case the incentive constraint for family business is satisfied: 

\[ p - (1 - \delta) v_u(0) \geq (1 - \delta)(1 - z)/\delta \]

while either the incentive or participation constraint for intermediary business are not satisfied: Either

\[ p - \tilde{p}(0) - (1 - \delta)v_u(0)/\bar{a} \leq (1 - \delta)(\tilde{p}(0) - z)/\delta, \]

or

\[ p \leq \tilde{p}(0)\bar{a}/(\bar{a} - 1) \]

or both hold. Then only family business can operate in the L sector. In this case: If \( a < \underline{a} \), the agent becomes a worker in the C-sector, while if \( a \geq \underline{a} \), the agent operates a family business in the L sector. We have

\[ X_L(p) = (1 - \sigma)(1 - G(\underline{a})) \text{ and } L_C(p) = (1 - \sigma)G(\underline{a}). \]

(3) \( p > \max\{p_R(0), \tilde{p}(0)\bar{a}/(\bar{a} - 1)\} \)

We show that in this region, intermediary businesses must operate. Suppose not. Then \( k = 0 \). But since

\[ (p - \tilde{p}(0) - (1 - \delta)v_u(0)/\bar{a}) > (1 - \delta)(\tilde{p}(0) - z)/\delta, \]

and

\[ (p - \tilde{p}(0))\bar{a} > p, \]

the incentive constraint and the participation constraint for retailing are satisfied for agents with \( a \) close enough to \( \bar{a} \).

In this price region, the incentive constraint for a family business is also satisfied. Suppose not. Then any agent with \( a < a^{**} \) becomes a potential supplier (i.e., someone who seeks a supply contract), and agents with \( a \geq a^{**} \) become intermediaries. Then the equilibrium \( k \) is \( k_R(p) \). As shown above, \( p - \tilde{p}(k_R(p)) \) is increasing in \( p \), implying that \( p - (1 - \delta)v_u(k_R(p)) \) is also so. \( p > p_R(0) > p_F(0) \) implies

\[ p - p_F(k_R(p)) > p_R(0) - p_F(k_R(p_R(0))) = p_R(0) - p_F(0) > 0 \]
This means that the incentive constraint for a family business is satisfied in this price region. Therefore any agent with $a \in [a, a^*(k_F(p), p)]$ will operate a family business.

In this region, therefore, occupational choices are as follows: (i) If $a < a$, the agent becomes a potential supplier; (ii) if $a \in [a, a^*(k_F(p), p)]$, the agent becomes a family business; (iii) if $a > a^*(k_F(p), p)$, the agent becomes an intermediary. The supply of good $L$ is

$$X_L(p) = (1 - \sigma)[G(a^*(k_F(p), p)) - G(a) + \int_{a^*(k_F(p), p)}^{\tilde{a}} adG(a)]$$

while the supply of unskilled labor in the C-sector is

$$L_C(p) = (1 - \sigma)(1 - k_F(p))G(a).$$

This completes the proof of Proposition 1.

**Proof of Proposition 2** Note that for $p$ such that $p > \max\{p_R(0), \tilde{p}(0)\}/(\tilde{a} - 1)$, the following properties hold:

(i) $(1 - \delta)v_u(k_F(p))$ and $(1 - \delta)v_h(k_F(p))$ are increasing in $p$

(ii) $p - \tilde{p}(k_F(p))$, $p - (1 - \delta)v_u(k_F(p))$ and $p - (1 - \delta)v_h(k_F(p))$ are positive and increasing in $p$

(iii) Consider the change from $p$ to $p'$ so that $p' > p$. Then $(p - \tilde{p}(k_F(p)))a^*(k_F(p), p) - p < (p' - \tilde{p}(k_F(p')))a^*(k_F(p), p) - p'$

Properties (i) and (ii) have already been established in the proof of Proposition 1. For (iii), first consider the case $a^*(k_F(p), p) = \frac{p}{p - \tilde{p}(k_F(p))}$. Since $a^*(k_F(p), p) = \frac{p}{p - \tilde{p}(k_F(p))} > a^*(k_F(p'), p') \geq \frac{p'}{p' - \tilde{p}(k_F(p'))}$,

$$(p - \tilde{p}(k_F(p)))a^*(k_F(p), p) - p = 0 < (p' - \tilde{p}(k_F(p')))a^*(k_F(p), p) - p'$$

Next suppose that $a^*(k_F(p), p) = a_R(k_F(p), p)$. Then from the definition of $a^* = a^*(k_F(p), p)$,

$$(p - \tilde{p}(k_F(p)))a^* = (1 - \delta)[v_u(k_F(p)) + (\tilde{p}(k_F(p)) - z)a^*/\delta].$$
Using

\[(1 - \delta)w_a(k) = \tilde{p} - c\]

where \(c = \frac{1 - \delta(1 - h)}{\delta(1 - h)}(1 - z)\), and \(\tilde{p} = \tilde{p}(k_F(p))\), the above equality reduces to

\[(1 - \tilde{p}/p)a^* = \tilde{p}/p - c/p + (1 - \delta)(\tilde{p}/p - z/p)a^*/\delta\]

or equivalently

\[
\frac{\tilde{p}}{p} = \frac{a^* + c/p + (1 - \delta)/\delta(za^*/p)}{a^* + 1 + (1 - \delta)a^*/\delta}.
\]

On the other hand, since \(a^* > a^*(k_F(p'), p') \geq a_R(k_F(p'), p')\), with \(p' \equiv \tilde{p}(k_F(p'))\),

\[(p' - \tilde{p}')a^* > p' - c + (1 - \delta)\tilde{p}' - z)a^*/\delta.
\]

This is equivalent to

\[
\frac{\tilde{p}}{p} < \frac{a^* + c/p' + (1 - \delta)/\delta(za^*/p')}{a^* + 1 + (1 - \delta)a^*/\delta}.
\]

Therefore \(p < p'\) implies \(\tilde{p}'/p' < \tilde{p}/p\). This establishes property (i) of Proposition 2. And property (iii) follows from:

\[0 < (p - \tilde{p})a^* - p = p[(1 - \tilde{p}/p)a^* - 1] < p'[1 - (\tilde{p}'/p')a^* - 1] = (p' - \tilde{p}')a^* - p'.\]

This completes the proof of Proposition 2.

**Proof of Proposition 6.** Result (a) has been established in Lemma 1. Result (b) follows from the fact that with free trade-cum-outsourcing, both the supply price and the consumer price of the L-good must be the same across countries. So we need to establish (c).

Consider first the case where \(a^* = a_R\) in both countries, where the incentive constraint for intermediaries just binds. In that case we need to show that \(a_R^S \geq a_R^N\). This latter property implies the result more generally: if \(a^* > a_R^S\) then \(a^* = \frac{P_L}{p_L - P_L}\) in which case \(a^*N\) must also equal this value. Otherwise \(a^* = a_R^N > \frac{P_L}{p_L - P_L}\) and therefore \(a_R^S < a^* = \frac{P_L}{p_L - P_L} < a_R^N\).
The incentive constraint now takes the form:

\[ P_L - \tilde{P}_L - (1 - \delta) \frac{V_u^i(a_R^i)}{a_R^i} = \frac{1 - \delta}{\delta} [\tilde{P}_L - zw^S] \]  \hspace{1cm} (13)

where there is no country superscript on \( P_L \) or \( \tilde{P}_L \) since both are equalized under globalization, and the deviation payoffs use the unskilled wage in country \( S \) because that is the cheapest way for suppliers in either country to procure a unit of the low quality good. Dividing through by \( P_L \) we obtain

\[ 1 - \frac{\tilde{P}_L}{P_L} - (1 - \delta) \frac{V_u^i(a_R^i)}{P_L a_R^i} = \frac{1 - \delta}{\delta} \left[ \frac{\tilde{P}_L}{P_L} - z \frac{1}{P^S} \right]. \]  \hspace{1cm} (14)

Moreover the supply price in both countries is set at the point where suppliers' incentive constraint is binding:

\[ \frac{\tilde{P}_L}{P_L} = (1 - \delta) \frac{V_u^i(k^i)}{P_L} + \frac{[1 - \delta(1 - h)][(1 - z) w^i]}{\delta(1 - h) P_L} \]  \hspace{1cm} (15)

Thus \( w^S < w^N \) implies that \( \frac{V_u^S}{P_L} > \frac{V_u^N}{P_L} \). From (14) it now follows that \( a_R^S \geq a_R^N \). This completes the proof of Proposition 6.

**Proof of Proposition 7** Notice that equation (13) for the country \( i \) threshold type \( a_R^i \) where the incentive constraint for intermediation is satisfied, can be written as

\[ P_L^W - \tilde{P}_L^i(k^i) - (1 - \delta) \frac{V_u^i(k^i)}{a_R^i} = \frac{1 - \delta}{\delta} [\tilde{P}_L^i(k^i) - zw^S(k^S)] \]  \hspace{1cm} (13)

where

\[ w^i(k^i) = \beta \left[ \frac{\sigma^i}{(1 - \sigma^i)(1 - k^i) G(u)} \right]^{1 - \beta} \]

\[ (1 - \delta)V_u^i(k^i) = w^i(k^i)[1 + (1 - z) \frac{\phi(k^i)}{\delta(1 - h)(1 - \phi(k^i))}] \]

and

\[ \tilde{P}_L^i(k^i) = (1 - \delta) V_u^i + w^i(k^i) \frac{[1 - \delta(1 - h)][1 - z]}{\delta(1 - h)}. \]

Suppressing \( P_L^W \) in the notation, \( a_R^S = a_R^S(k^S) \) is increasing, while \( a_N^N = a_N^N(k^N, k^S) \) is increasing in \( k^N \) and decreasing in \( k^S \). Therefore \( a^S(k^S) = \)

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max{\(a, \frac{P^w}{P^w - \bar{P}^N(k^S)}\), \(a_R^N(k^S)\)} and \(a^*N(k^N, k^S) = \max\{\alpha, \frac{P^w}{P^w - \bar{P}^N(k^N)}\), \(a_R^N(k^N, k^S)\}\). It is easily checked that \(a^*S\) is increasing in \(k^S\).

Outsourcing causes \(k^S\) to rise. Otherwise, if \(k^S\) decreases or remains the same, we have \(a^*S\) falling or remaining the same, so \(\int_{a^*S} \alpha dG(\alpha)\) cannot go down. Therefore

\[
k^S(1 - \sigma^S)G(\alpha) - \int_{a^*S} \alpha dG(\alpha) \leq 0 \quad (16)
\]
as this expression equaled 0 in the absence of outsourcing.

On the other hand, equilibrium in the market for supply contracts with outsourcing implies that

\[
k^S(1 - \sigma^S)G(\alpha) + k^N(1 - \sigma^N)G(\alpha) = (1 - \sigma^S) \int_{a^*S} \alpha dG(\alpha) + (1 - \sigma^N) \int_{a^*N} \alpha dG(\alpha) \quad (17)
\]
We have shown above (Proposition 6) that \(w^S < w^N\), \(k^S > k^N\) and \(a^*S \geq a^*N\). Therefore \(k^SG(\alpha) > k^NG(\alpha)\) while \(\int_{a^*S} \alpha dG(\alpha) \leq \int_{a^*N} \alpha dG(\alpha)\). This implies that

\[
(1 - \sigma^S)[k^SG(\alpha) - \int_{a^*S} \alpha dG(\alpha)] > 0 > (1 - \sigma^N)[k^NG(\alpha) - \int_{a^*N} \alpha dG(\alpha)]
\]
which contradicts (16).

Outsourcing also causes \(k^N\) to decrease. Let \(a_R^N(k^N)\) be \(a_R^N\) which satisfies

\[
P^w_L - \bar{P}^N_L(k^N) - (1 - \delta)\frac{V^N_N(k^N)}{a_R^N} = \frac{1 - \delta}{\delta}[\bar{P}^N_L(k^N) - z w^N(k^N)]
\]
Since \(w^S(k^S) < w^N(k^N)\) in an equilibrium with outsourcing, \(a_R^N(k^N, k^S) > a_R^N(k^N)\). With \(a^*N(k^N) = \max\{a, \frac{P^w}{P^w - \bar{P}^N(k^N)}, a_R^N(k^N)\}\), \(a^*N(k^N, k^S) \geq a^*N(k^N)\). Now suppose that outsourcing does not decrease \(k^N\). Since \(k^NG(\alpha) - \int_{a^*N(k^N)} \alpha dG(\alpha)\) is increasing in \(k^N\) and zero in an equilibrium of free trade,

\[
0 \leq k^NG(\alpha) - \int_{a^*N(k^N)} \alpha dG(\alpha) \leq k^NG(\alpha) - \int_{a^*N(k^N, k^S)} \alpha dG(\alpha)
\]
in an equilibrium with outsourcing. This contradicts \(k^NG(\alpha) - \int_{a^*N(k^N, k^S)} \alpha dG(\alpha) < 0\). This completes the proof of Proposition 7.
REFERENCES


NOTES

1. Once could also reinterpret the capital as a form of specialized human capital: the C-sector requires workers with specific technical skills (such as a specialized engineering education) as well as unskilled workers. In this interpretation, there are two kinds of skills in the workforce: technical skill (useful in the C-sector) and entrepreneurial skill (useful in the L-sector).

2. See Feenstra and Hanson [1996], Hanson and Harrison [1999], Winters, McCulloch and McKay [2004], Goldberg and Pavcnik [2007].

3. Winters, McCulloch and McKay [2004] provide an overview of the more recent literature on this topic and argue that human capital and infrastructure differences can possibly account for contrasting reactions of wage differentials to trade openness in East Asia and Latin America. Baliamoune-Lutz and Ndikumana [2007] provide cross-country evidence in favor of the hypothesis that the growth impact of trade liberalization in a cross-section of African countries varied with institutional quality.

4. An alternative interpretation is that they hire workers, as in the shirking model of Shapiro-Stiglitz [1984].

5. The incentive constraint for supplier is

\[
\frac{\hat{P}_L + \delta h V_u}{1 - \delta (1 - h)} \geq \hat{P}_L + (1 - z) w + \delta V_u
\]

with the supply contract where \(\hat{P}_L\) is paid for each period as long as it is not terminated.

6. More generally, the skills could be imparted to agents at all values of \(a\). One would expect, however, that the impact on poorer agents would be greater, in the presence of credit constraints that inhibit educational investments in private schooling.
7. Note that the supply function of the L-sector is discontinuous at \( p = p_F(0) \). At \( p \) slightly below \( p_F(0) \), supply is zero, while it is \((1 - \sigma)(1 - G(\bar{a}))\) at \( p \) at or slightly above \( p_F(0) \). If (8) is violated, we cannot have a competitive equilibrium with \( p \) above \( p_F(0) \), as there is excess supply of the L good. And we cannot have an equilibrium at \( p \) below \( p_F(0) \) as that will involve excess demand for the L good. So equilibrium must entail \( p = p_F(0) \) and rationing of supply.

8. See Feenstra [1998] for a discussion of the role of international outsourcing on wage inequality in OECD countries. He argues that the role of outsourcing and skill-biased technical change are complementary and that it is often difficult to separate the two. Nevertheless there are some empirical estimates of the relative significance of the two in explaining patterns of increasing wage dispersion in the US between 1972-90, which assign a non-negligible fraction (20%) to international out-sourcing.
Figure 1: L-Sector Equilibrium Occupational Choices

\[ p_F(0) \quad \max\{p_R(0), \tilde{p}(0)\bar{a}/(\bar{a} - 1)\} \]
Figure 2: Comparative Statics of L-Sector Earning Patterns as \( p \) Increases