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THE IMPACT OF TRADE ON INTRA-INDUSTRY REALLOCATIONS AND AGGREGATE INDUSTRY PRODUCTIVITY

BY MARC J. MELITZ[1]

This paper develops a dynamic industry model with heterogeneous firms to analyze the intra-industry effects of international trade. The model shows how the exposure to trade will induce only the more productive firms to enter the export market (while some less productive firms continue to produce only for the domestic market) and will simultaneously force the least productive firms to exit. It then shows how further increases in the industry's exposure to trade lead to additional inter-firm reallocations towards more productive firms. The paper also shows how the aggregate industry productivity growth generated by the reallocations contributes to a welfare gain, thus highlighting a benefit from trade that has not been examined theoretically before. The paper adapts Hopenhayn's (1992a) dynamic industry model to monopolistic competition in a general equilibrium setting. In so doing, the paper provides an extension of Krugman's (1980) trade model that incorporates firm level productivity differences. Firms with different productivity levels coexist in an industry because each firm faces initial uncertainty concerning its productivity before making an irreversible investment to enter the industry. Entry into the export market is also costly, but the firm's decision to export occurs after it gains knowledge of its productivity.

KEYWORDS: Intra-industry trade, firm heterogeneity, firm dynamics, [illegible]

1. INTRODUCTION

RECENT EMPIRICAL RESEARCH using longitudinal plant or firm-level data from several countries has overwhelmingly substantiated the existence of large and persistent productivity differences among establishments in the same narrowly defined industries. Some of these studies have further shown that these productivity differences are strongly correlated with the establishment's export status: relatively more productive establishments are much more likely to export (even within so-called "export sectors," a substantial portion of establishments do not export). Other studies have highlighted the large levels of resource reallocations that occur across establishments in the same industry. Some of these studies have also correlated these reallocations with the estabthe more productive firms reallocate market shares towards the more productive firms and contribute to an aggregate productivity increase. Profits are also reallocated towards more productive firms. The model is also consistent with the widely reported stories in the business press describing how the exposure to trade enhances the growth opportunities of some firms while simultaneously contributing to the downfall or "downsizing" of other firms in the same industry; similarly, protection from trade is often reported to shelter inefficient firms. Rigorous empirical work has recently corroborated this anecdotal evidence. Bernard and Jensen (1999a) (for the U.S.), Aw, Chung, and Roberts (2000) (for Taiwan), and Clerides, Lack, and Tybout (1998) (for Colombia, Mexico, and Morocco) all find evidence that more productive firms self-select into export markets. Aw, Chung, and Roberts (2000) also find evidence suggesting that exposure to trade forces the least productive firms to exit. Pavcnik (2002) directly looks at the contribution of market share reallocations to sectoral productivity growth following trade liberalization in Chile. She finds that these reallocations significantly contribute to productivity growth in the tradable sectors. In a related study, Bernard and Jensen (1999b) find that within-sector market share reallocations towards more productive exporting plants accounts for 20% of U.S. manufacturing productivity growth.

Clearly, these empirical patterns cannot be motivated without appealing to a model of trade incorporating firm heterogeneity. Towards this goal, this paper embeds firm productivity heterogeneity within Krugman's model of trade under monopolistic competition and increasing returns. The current model draws heavily from Hopenhayn's (1992a, 1992b) work to explain the endogenous selection of heterogeneous firms in an industry. Hopenhayn derives the equilibrium distribution of firm productivity from the profit maximizing decisions of initially identical firms who are uncertain of their initial and future productivity.[2] This paper adapts his model to a monopolistically competitive industry (Hopenhayn only considers competitive firms) in a general equilibrium setting.[3] A contribution of this paper is to provide such a general equilibrium model incorporating firm heterogeneity that yet remains highly tractable. This is achieved by integrating firm heterogeneity in a way such that the relproductivity heterogeneity yields identical aggregate outcomes as one with representative firms that all share the same average productivity level.

This simplicity does not come without some concessions. The analysis relies on the Dixit and Stiglitz (1977) model of monopolistic competition. Although this modeling approach is quite common in the trade literature, it also exhibits some well-known limitations. In particular, the firms' markups are exogenously fixed by the symmetric elasticity of substitution between varieties. Another concession is the simplification of the firm productivity dynamics modeled by Hopenhayn (1992a). Nevertheless, the current model preserves the initial firm uncertainty over productivity and the forward looking entry decision of firms facing sunk entry costs and expected future probabilities of exit. As in Hopenhayn (1992a), the analysis is restricted to stationary equilibria. Firms correctly anticipate this stable aggregate environment when making all relevant decisions. The analysis then focuses on the long run effects of trade on the relative behavior and performance of firms with different productivity levels.

Another recent paper by Bernard, Eaton, Jenson, and Kortum (2000) (henceforth BEJK) also introduces firm-level heterogeneity into a model of trade by adapting a Ricardian model to firm-specific comparative advantage. Both papers predict the same basic kinds of trade-induced reallocations, although the channels and motivations behind these reallocations vary. In BEJK, firms compete to produce the same variety—including competition between domestic and foreign producers of the same variety. This delivers an endogenous distribution of markups, a feature that is missing in this paper. BEJK also show how their model can be calibrated to provide a good fit to a combination of micro and macro US data patterns. Comparative statics are then obtained

One last, but important, innovation in the current paper is to introduce the dynamic forward-looking entry decision of firms facing sunk market entry costs. Firms face such costs, not just for their domestic market, but also for any potential export market.[5] These costs are in addition to the per-unit trade costs that are typically modeled. Both survey and econometric works have documented the importance of such export market entry costs. Das, Roberts, and Tybout (2001) econometrically estimate these costs average over U.S. $1 Million for Colombian plants producing industrial chemicals. As will be detailed later, surveys reveal that managers making export related decisions are much more concerned with export costs that are fixed in nature rather than high per-unit costs. Furthermore, Roberts and Tybout (1977a) (for Colombia), Bernard and Jensen (2001) (for the U.S.), and Bernard and Wagner (2001) (for Germany) estimate that the magnitude of sunk export market entry costs is important enough to generate very large hysteresis effects associated with a plant's export market participation.[6]

2. SETUP OF THE MODEL

2.1. *Demand*

The preferences of a representative consumer are given by a C.E.S. utility function over a continuum of goods indexed by ω:

where the measure of the set Ω represents the mass of available goods. These goods are substitutes, implying $0 < \rho < 1$ and an elasticity of substitution between any two goods of $\sigma = 1/(1-\rho) > 1$. As was originally shown by Dixit and Stiglitz (1977), consumer behavior can be modeled by considering the set of varieties consumed as an aggregate good $Q \equiv U$ associated with an aggregate price

$$(1) \qquad P = \left[\int_{\omega \in \Omega} p(\omega)^{1-\sigma} d\omega \right]^{\frac{1}{1-\sigma}}.$$

These aggregates can then be used to derive the optimal consumption and expenditure decisions for individual varieties using

$$(2) \qquad \begin{aligned} q(\omega) &= Q\left[\frac{p(\omega)}{P}\right]^{-\sigma}, \\ r(\omega) &= R\left[\frac{p(\omega)}{P}\right]^{1-\sigma}, \end{aligned}$$

where $R = PQ = \int_{\omega\in\Omega} r(\omega)d\omega$ denotes aggregate expenditure.

2.2. *Production*

There is a continuum of firms, each choosing to produce a different variety ω. Production requires only one factor, labor, which is inelastically supplied at its aggregate level L, an index of the economy's size. Firm technology is represented by a cost function that exhibits constant marginal cost with a fixed

On the other hand, the ratios of any two firms' outputs and revenues only depend on the ratio of their productivity levels:

$$\frac{q(\varphi_1)}{q(\varphi_2)} = \left(\frac{\varphi_1}{\varphi_2}\right)^{\sigma}, \qquad \frac{r(\varphi_1)}{r(\varphi_2)} = \left(\frac{\varphi_1}{\varphi_2}\right)^{\sigma-1}. \tag{6}$$

In summary, a more productive firm (higher φ) will be bigger (larger output and revenues), charge a lower price, and earn higher profits than a less productive firm.

2.3. *Aggregation*

An equilibrium will be characterized by a mass M of firms (and hence M goods) and a distribution $\mu(\varphi)$ of productivity levels over a subset of $(0, \infty)$. In such an equilibrium, the aggregate price P defined in (1) is then given by

$$P = \left[\int_0^\infty p(\varphi)^{1-\sigma} M \mu(\varphi)\, d\varphi\right]^{\frac{1}{1-\sigma}}.$$

Using the pricing rule (3), this can be written $P = M^{1/(1-\sigma)} p(\tilde{\varphi})$, where

$$\tilde{\varphi} = \left[\int_0^\infty \varphi^{\sigma-1} \mu(\varphi)\, d\varphi\right]^{\frac{1}{\sigma-1}}. \tag{7}$$

$\tilde{\varphi}$ is a weighted average of the firm productivity levels φ and is independent of the number of firms M.[8] These weights reflect the relative output shares of

This variable will be alternatively referred to as aggregate or average productivity. Further note that $\bar{r} = R/M$ and $\bar{\pi} = \Pi/M$ represent both the average revenue and profit per firm as well as the revenue and profit level of the firm with average productivity level $\varphi = \tilde{\varphi}$.

3. FIRM ENTRY AND EXIT

[redacted]

Prior to entry, firms are identical. To enter, firms must first make an initial investment, modeled as a fixed entry cost $f_e > 0$ (measured in units of labor), which is thereafter sunk. Firms then draw their initial productivity parameter φ from a common distribution $g(\varphi)$.[10] $g(\varphi)$ has positive support over $(0, \infty)$ and has a continuous cumulative distribution $G(\varphi)$.

Upon entry with a low productivity draw, a firm may decide to immediately exit and not produce. If the firm does produce, it then faces a constant (across [redacted]

force it to exit. Although there are some realistic examples of severe shocks forced to exit. Assuming that there is no time discounting,[12] each firm's value function is given by

$$v(\varphi) = \max\left\{0, \sum_{t=0}^{\infty}(1-\delta)^t \pi(\varphi)\right\} = \max\left\{0, \frac{1}{\delta}\pi(\varphi)\right\},$$

where the dependence of $\pi(\varphi)$ on R and P from (5) is understood. Thus, $\varphi^* = \inf\{\varphi : v(\varphi) > 0\}$ identifies the lowest productivity level (hereafter referred to as the cutoff level) of producing firms. Since $\pi(0) = -f$ is negative, $\pi(\varphi^*)$ must be equal to zero. This will be referred to as the zero cutoff profit condition.

Any entering firm drawing a productivity level $\varphi < \varphi^*$ will immediately exit and never produce. Since subsequent firm exit is assumed to be uncorrelated with productivity, the exit process will not affect the equilibrium productivity distribution $\mu(\varphi)$. This distribution must then be determined by the initial productivity draw, conditional on successful entry. Hence, $\mu(\varphi)$ is the conditional distribution of $g(\varphi)$ on $[\varphi^*, \infty)$:

$$\text{(8)} \qquad \mu(\varphi) = \begin{cases} \dfrac{g(\varphi)}{1 - G(\varphi^*)} & \text{if } \varphi \geq \varphi^*, \\ 0 & \text{otherwise,} \end{cases}$$

and $p_{in} \equiv 1 - G(\varphi^*)$ is the ex-ante probability of successful entry.[13] This defines the aggregate productivity level $\tilde{\varphi}$ as a function of the cutoff level φ^*:[14]

$$\text{(9)} \qquad \tilde{\varphi}(\varphi^*) = \left[\frac{1}{1 - G(\varphi^*)} \int_{\varphi^*}^{\infty} \varphi^{\sigma-1} g(\varphi)\, d\varphi\right]^{\frac{1}{\sigma-1}}.$$

The assumption of a finite $\tilde{\varphi}$ imposes certain restrictions on the size of the upper tail of the distribution $g(\varphi)$: the $(\sigma - 1)$th uncentered moment of $g(\varphi)$ must be finite. Equation (8) clearly shows how the shape of the equilibrium distribution of productivity levels is tied to the exogenous ex-ante distribution $g(\varphi)$ while allowing the range of productivity levels (indexed by the cutoff φ^*) to be endogenously determined. Equation (9) then shows how this endogenous range affects the aggregate productivity level.

[12] Again, this is assumed for simplicity. The probability of exit δ introduces an effect similar to time discounting. Modeling an additional time discount factor would not qualitatively change any of the results.

[13] The equilibrium distribution $\mu(\varphi)$ can be determined from the distribution of initial productivity with certainty by applying a law of large numbers to $g(\varphi)$. See Hopenhayn (1992a, note 5) for further details.

[14] This dependence of $\tilde{\varphi}$ on φ^* is understood when it is subsequently written without its argument.

3.1. *Zero Cutoff Profit Condition*

Since the average productivity level $\tilde{\varphi}$ is completely determined by the cutoff productivity level φ^*, the average profit and revenue levels are also tied to the [illegible]

$$\bar{r} = r(\tilde{\varphi}) = \left[\frac{\tilde{\varphi}(\varphi^*)}{\varphi^*}\right]^{\sigma-1} r(\varphi^*), \qquad \bar{\pi} = \pi(\tilde{\varphi}) = \left[\frac{\tilde{\varphi}(\varphi^*)}{\varphi^*}\right]^{\sigma-1} \frac{r(\varphi^*)}{\sigma} - f.$$

The zero cutoff profit condition, by pinning down the revenue of the cutoff firm, then implies a relationship between the average profit per firm and the cutoff productivity level:

$$(10) \qquad \pi(\varphi^*) = 0 \iff r(\varphi^*) = \sigma f \iff \bar{\pi} = f k(\varphi^*),$$

where $k(\varphi^*) = [\tilde{\varphi}(\varphi^*)/\varphi^*]^{\sigma-1} - 1$.

3.2. *Free Entry and the Value of Firms*

Since all incumbent firms—other than the cutoff firm—earn positive profits, the average profit level $\bar{\pi}$ must be positive. In fact, the expectation of future positive profits is the only reason that firms consider sinking the investment cost f_e required for entry. Let $\bar{v}$ represent the present value of the average [illegible]

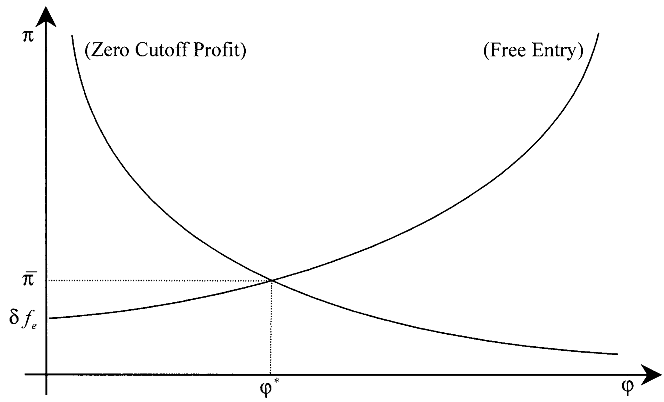

FIGURE 1.—Determination of the equilibrium cutoff φ^* and average profit $\bar{\pi}$.

uniqueness of the equilibrium φ^* and $\bar{\pi}$, which is graphically represented in Figure 1.[15]

In a stationary equilibrium, the aggregate variables must also remain constant over time. This requires a mass M_e of new entrants in every period, such that the mass of successful entrants, $p_{in}M_e$, exactly replaces the mass δM of incumbents who are hit with the bad shock and exit: $p_{in}M_e = \delta M$. The equilibrium distribution of productivity $\mu(\varphi)$ is not affected by this simultaneous entry and exit since the successful entrants and failing incumbents have the same distribution of productivity levels. The labor used by these new entrants for investment purposes must, of course, be reflected in the accounting for aggregate labor L, and affects the aggregate labor available for production: $L = L_p + L_e$ where L_p and L_e represent, respectively, the aggregate labor used size.[16] The mass of producing firms in any period can then be determined from the average profit level using

(13) $M = R \quad L$

[redacted]

$M^{1/(1-\sigma)}/\rho\tilde{\varphi}$, which completes the characterization of the unique stationary equilibrium in the closed economy.

4.1. *Analysis of the Equilibrium*

All the firm-level variables—the productivity cutoff φ^* and average $\tilde{\varphi}$, and the average firm profit $\bar{\pi}$ and revenue $\bar{r}$—are independent of the country size L. As indicated by (13), the mass of firms increases proportionally with country size, although the distribution of firm productivity levels $\mu(\varphi)$ remains unchanged. Welfare per worker, given by

(14) $$W = P^{-1} = M^{\frac{1}{\sigma-1}}\rho\tilde{\varphi},$$

5. OVERVIEW AND ASSUMPTIONS OF THE OPEN ECONOMY MODEL

I now examine the impact of trade in a world (or trade bloc) that is composed of countries whose economies are of the type that was previously described. When there are no additional costs associated with trade, then trade allows the individual countries to replicate the outcome of the integrated world economy. Trade then provides the same opportunities to an open economy as would an increase in country size to a closed economy. As was previously discussed, an increase in country size has no effect on firm level outcomes. The transition to trade will thus not affect any of the firm level variables: The same number of firms in each country produce at the same output levels and earn the same profits as they did in the closed economy. All firms in a given country divide their sales between domestic and foreign consumers, based on the size of their country relative to the integrated world economy. Thus, in the absence of any costs to trade, the existence of firm heterogeneity does not affect the impact of trade. This impact is identical to the one described by Krugman (1980) with representative firms: Although firms are not affected by the transition to trade, consumers enjoy welfare gains driven by the increase in product variety.[17]

On the other hand, there is mounting evidence that firms wishing to export appropriately modeled as independent of the firm's export volume decision.[18]

When there is uncertainty concerning the export market, the timing and sunk nature of the costs become quite relevant for the export decision (most of the previously mentioned costs must be sunk prior to entry into the export market). The strong and robust empirical correlations at the firm level between export status and productivity suggest that the export market entry decision occurs after the firm gains knowledge of its productivity, and hence that uncertainty concerning the export markets is not predominantly about productivity (as is the uncertainty prior to entry into the industry). I therefore assume that a firm who wishes to export must make an initial fixed investment, but that ables. Each firm's pricing rule in its domestic market is given, as before, by $p_d(\varphi) = w/\rho\varphi = 1/\rho\varphi$. Firms who export will set higher prices in the foreign markets that reflect the increased marginal cost τ of serving these markets: $p_x(\varphi) = \tau/\rho\varphi = \tau p_d(\varphi)$. Thus, the revenues earned from domestic sales and export sales to any given country are, respectively, $r_d(\varphi) = R(P\rho\varphi)^{\sigma-1}$ and $r_x(\varphi) = \tau^{1-\sigma} r_d(\varphi)$, where R and P denote the aggregate expenditure and price index in every country. The balance of payments condition implies that R also represents the aggregate revenue of firms in any country, and hence aggregate income. The combined revenue of a firm, $r(\varphi)$, thus depends on its export status:

$$(15) \qquad r(\varphi) = \begin{cases} r_d(\varphi) & \text{if the firm does not export,} \\ r_d(\varphi) + n r_x(\varphi) = (1 + n\tau^{1-\sigma}) r_d(\varphi) \\ & \text{if the firm exports to all countries.} \end{cases}$$

If some firms do not export, then there no longer exists an integrated world market for all goods. Even though the symmetry assumption ensures that all [redacted] to cover the export costs do not depend on this choice of representation.[22] The per-period profit flow of any exporting firm then reflects the per-period fixed cost f_x, which is incurred per export country.

Since no firm will ever export and not also produce for its domestic market,[23] each firm's profit can be separated into portions earned from domestic sales, $\pi_d(\varphi)$, and export sales per country, $\pi_x(\varphi)$, by accounting for the entire overhead production cost in domestic profit:

$$(16) \qquad \pi_d(\varphi) = \frac{r_d(\varphi)}{\sigma} - f, \qquad \pi_x(\varphi) = \frac{r_x(\varphi)}{\sigma} - f_x.$$

A firm who produces for its domestic market exports to all n countries if $\pi_x(\varphi) \geq 0$. Each firm's combined profit can then be written: $\pi(\varphi) = \pi_d(\varphi) + \max\{0, n\pi_x(\varphi)\}$. Similarly to the closed economy case, firm value is given by $v(\varphi) = \max\{0, \pi(\varphi)/\delta\}$, and $\varphi^* = \inf\{\varphi : v(\varphi) > 0\}$ identifies the cutoff productivity level for successful entry. Additionally, $\varphi_x^* = \inf\{\varphi : \varphi \geq \varphi^*$ and

[illegible]

formally derived, it exhibits several similar properties to the equilibrium with partitioning that will be highlighted.[24]

Once again, the equilibrium distribution of productivity levels for incumbent firms, $\mu(\varphi)$, is determined by the ex-ante distribution of productivity levels, conditional on successful entry: $\mu(\varphi) = g(\varphi)/[1 - G(\varphi^*)]\ \forall \varphi \geq \varphi^*$. The ex-ante probability of successful entry is still identified by $p_{in} = 1 - G(\varphi^*)$. Furthermore, $p_x = [1 - G(\varphi_x^*)]/[1 - G(\varphi^*)]$ now represents the ex-ante probability that one of these successful firms will export. The ex-post fraction of firms that export must then also be represented by p_x. Let M denote the equilibrium mass of incumbent firms in any country. $M_x = p_x M$ then represents the mass of exporting firms while $M_t = M + nM_x$ represents the total mass of varieties available to consumers in any country (or alternatively, the total mass of firms competing in any country).

6.2. *Aggregation*

Using the same weighted average function defined in (9), let $\tilde{\varphi} = \tilde{\varphi}(\varphi^*)$ and $\tilde{\varphi}_x = \tilde{\varphi}(\varphi_x^*)$ denote the average productivity levels of, respectively, all firms and exporting firms only. The average productivity across all firms, $\tilde{\varphi}$, is based only on domestic market share differences between firms (as reflected by differences in the firms' productivity levels). If some firms do not export, then this average will not reflect the additional export shares of the more productive firms. Furthermore, neither $\tilde{\varphi}$ nor $\tilde{\varphi}_x$ reflect the proportion τ of output units that are "lost" in export transit. Let $\tilde{\varphi}_t$ be the weighted productivity average [illegible] only the productivity average $\tilde{\varphi}_t$ and the number of varieties consumed M_t:[25]

$$(17)\quad \begin{aligned} &P = M_t^{\frac{1}{1-\sigma}} p(\tilde{\varphi}_t) = M_t^{\frac{1}{1-\sigma}} \frac{1}{\rho \tilde{\varphi}_t}, \qquad R = M_t r_d(\tilde{\varphi}_t), \\ &W = \frac{R}{L} M_t^{\frac{1}{\sigma-1}} \rho \tilde{\varphi}_t. \end{aligned}$$

By construction, the productivity averages $\tilde{\varphi}$ and $\tilde{\varphi}_x$ can also be used to express the average profit and revenue levels across different groups of firms:

As before, $\bar{v} = \sum_{t=0}^{\infty}(1-\delta)^t\bar{\pi} = \bar{\pi}/\delta$ represents the present value of the average profit flows and $v_e = p_{in}\bar{v} - f_e$ yields the net value of entry. The free entry condition thus remains unchanged: $v_e = 0$ if and only if $\bar{\pi} = \delta f_e / p_{in}$. Regardless of profit differences across firms (based on export status), the expected value of future profits, in equilibrium, must equal the fixed investment cost.

6.4. *Determination of the Equilibrium*

As in the closed economy case, the free entry condition and the new zero cutoff profit condition identify a unique φ^* and $\bar{\pi}$: the new ZCP curve still cuts the FE curve only once from above (see Appendix for proof). The equilibrium φ^*, in turn, determines the export productivity cutoff φ_x^* as well as the average productivity levels $\tilde{\varphi}$, $\tilde{\varphi}_x$, $\tilde{\varphi}_t$, and the ex-ante successful entry and export probabilities p_{in} and p_x. As was the case in the closed economy equilibrium, the free entry condition and the aggregate stability condition, $p_{in}M_e = \delta M$, ensure that the aggregate payment to the investment workers L_e equals the aggregate profit level Π. Thus, aggregate revenue R remains exogenously fixed by the size of the labor force: $R = L$. Once again, the average firm revenue is determined by the ZCP and FE conditions: $\bar{r} = r_d(\tilde{\varphi}) + p_x n r_x(\tilde{\varphi}_x) = \sigma(\bar{\pi} + f + p_x n f_x)$. This pins down the equilibrium mass of incumbent firms,

$$(21) \qquad M = \frac{R}{\bar{r}} = \frac{L}{\sigma(\bar{\pi} + f + p_x n f_x)}.$$

In turn, this determines the mass of variety available in every country, $M_t = (1 + np_x)M$, and their price index $P = M_t^{1/(1-\sigma)}/\rho\tilde{\varphi}_t$ (see (17)). Almost all of these equilibrium conditions also apply to the case where all firms export. The only difference is that $\varphi_x^* = \varphi^*$ (and hence $p_x = 1$) and (19) no longer holds.

7. THE IMPACT OF TRADE

The result that the modeling of fixed export costs explains the partitioning of firms by export status and productivity level is not exactly earth-shattering. This can be explained quite easily within a simple partial equilibrium model with a fixed distribution of firm productivity levels. On the other hand, such a model would be ill-suited to address several important questions concerning the impact of trade in the presence of export market entry costs and firm hetanalyses rely on comparisons of steady state equilibria and should therefore be interpreted as capturing the long run consequences of trade.

Let φ_a^* and $\tilde{\varphi}_a$ denote the cutoff and average productivity levels in autarky. [illegible]

I use the notation of the previous section for all variables and functions pertaining to the new open economy equilibrium. As was previously mentioned, the FE condition is identical in both the closed and open economy. Inspection of the new ZCP condition in the open economy (20) relative to the one in the closed economy (12) immediately reveals that the ZCP curve shifts up: the exposure to trade induces an increase in the cutoff productivity level ($\varphi^* > \varphi_a^*$) and in the average profit per firm. The least productive firms with productivity levels between φ_a^* and φ^* can no longer earn positive profits in the new trade equilibrium and therefore exit. Another selection process also occurs since only the firms with productivity levels above φ_x^* enter the export markets. This export market selection effect and the domestic market selection effect (of firms out of the industry) both reallocate market shares towards more efficient firms and contribute to an aggregate productivity gain.[26]

Inspection of the equations for the equilibrium number of firms ((13) and (21)) reveals that $M < M_a$ where M_a represents the number of firms in autarky.[27] Although the number of firms in a country decreases after the transition to trade, consumers in the country still typically enjoy greater product variety ($M_t = (1+np_x)M > M_a$). That is, the decrease in the number of domestic firms following the transition to trade is typically dominated by the number of new foreign exporters. It is nevertheless possible, when the export costs are high, that these foreign firms replace a larger number of domestic firms (if the latter are sufficiently less productive). Although product variety then impacts negatively on welfare, this effect is dominated by the positive contribution of the aggregate productivity gain. Trade—even though it is costly—always generates a welfare gain (see Appendix for proof).

7.1. *The Reallocation of Market Shares and Profits Across Firms*

[illegible]

firm's share of its domestic market (since R also represents aggregate consumer expenditure in the country). The impact of trade on this firm's market share can be evaluated using the following inequalities (see Appendix):

$$r_d(\varphi) < r_a(\varphi) < r_d(\varphi) + nr_x(\varphi) \quad \forall \varphi \geq \varphi^*.$$

The first part of the inequality indicates that all firms incur a loss in domestic sales in the open economy. A firm who does not export then also incurs a total revenue loss. The second part of the inequality indicates that a firm who exports more than makes up for its loss of domestic sales with export sales and increases its total revenues. Thus, a firm who exports increases its share of industry revenues while a firm who does not export loses market share. (The market share of the least productive firms in the autarky equilibrium—with productivity between φ_a^* and φ^*—drops to zero as these firms exit.)

Now consider the change in profit earned by a firm with productivity φ. If the firm does not export in the open economy, it must incur a profit loss, since its revenue, and hence variable profit, is now lower. The direction of the profit change for an exporting firm is not immediately clear since it involves a tradeoff between the increase in total revenue (and hence variable profit) and the increase in fixed cost due to the additional export cost. For such a firm ($\varphi \geq \varphi_x^*$), this profit change can be written:[28]

$$\begin{aligned}\Delta\pi(\varphi) = \pi(\varphi) - \pi_a(\varphi) &= \frac{1}{\sigma}([r_d(\varphi) + nr_x(\varphi)] - r_a(\varphi)) - nf_x \\ &= \varphi^{\sigma-1} f\left[\frac{1+n\tau^{1-\sigma}}{(\varphi^*)^{\sigma-1}} - \frac{1}{(\varphi_a^*)^{\sigma-1}}\right] - nf_x,\end{aligned}$$

where the term in the bracket must be positive since $r_d(\varphi) + nr_x(\varphi) > r_a(\varphi)$ for all $\varphi > \varphi^*$. The profit change, $\Delta\pi(\varphi)$, is thus an increasing function of the firm's productivity level φ. In addition, this change must be negative for the exporting firm with the cutoff productivity level φ_x^*:[29] Therefore, firms are par-

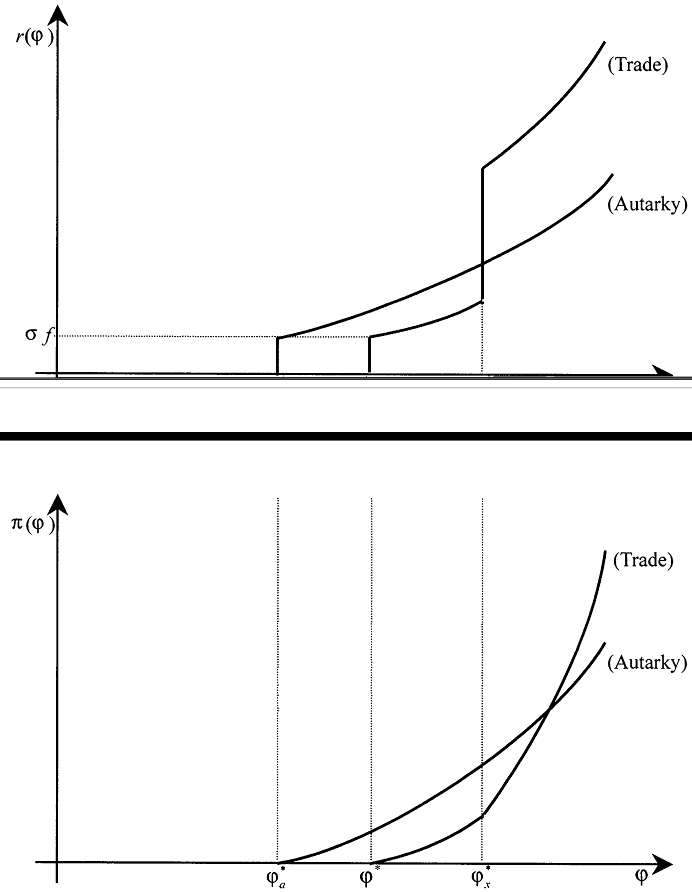

FIGURE 2.—The reallocation of market shares and profits.

7.2—Why Does Trade Force the Least Productive Firms to Exit?

to the higher potential returns associated with a good productivity draw. The increased labor demand by the more productive firms and new entrants bids up the real wage and forces the least productive firms to exit. [illegible]

The current model thus highlights a potentially important channel for the redistributive effects of trade within industries that operates through the expo- [illegible] sure to export markets. Recent work by Bernard and Jensen (1999b) suggests that this channel substantially contributes to U.S. productivity increases within manufacturing industries. Nevertheless, the model should also be interpreted with caution as it precludes another potentially important channel for the effects of trade, which operates through increases in import competition.

8. THE IMPACT OF TRADE LIBERALIZATION

The preceding analysis compared the equilibrium outcomes of an economy undergoing a massive change in trade regime from autarky to trade. Very few, if any, of the world's current economies can be considered to operate in an autarky environment. It is therefore reasonable to ask whether an *increase* in [illegible] the old equilibrium with n countries. I then add primes ($'$) to all variables and functions when they pertain to the new equilibrium with $n' > n$ countries.

Inspection of equations (20) and (19) defining the new zero cutoff profit condition (as a function of the domestic cutoff φ^*) reveals that the ZCP curve will shift up and therefore that both cutoff productivity levels increase with n: $\varphi^{*\prime} > \varphi^*$ and $\varphi_x^{*\prime} > \varphi_x^*$. The increase in the number of trading partners thus forces the least productive firms to exit. As was the case with the transition from autarky, the increased exposure to trade forces all firms to relinquish a portion of their share of their domestic market: $r_d{}'(\varphi) < r_d(\varphi)$, $\forall \varphi \geq \varphi^*$. The less productive firms who do not export (with $\varphi < \varphi_x^{*\prime}$) thus incur a revenue and profit loss—and the least productive among them exit.[31] Again, as was the case with the transition from autarky, the firms who export (with $\varphi \geq \varphi_x^{*\prime}$) more than make up for their loss of domestic sales with their sales to the new export markets and increase their combined revenues: $r_d{}'(\varphi) + n' r_x{}'(\varphi) > r_d(\varphi) + n r_x(\varphi)$. Some of these firms nevertheless incur a decrease in profits due to the new fixed export costs, but the most productive firms among this group also enjoy an increase in profits (which is increasing with the firms' productivity level). Thus, both market shares and profits are reallocated towards the more efficient firms. As was the case for the transition from autarky, this reallocation of market shares generates an aggregate productivity gain and an increase in welfare.[32]

8.2. *Decrease in Trade Costs*

A decrease in the variable trade cost τ will induce almost identical effects to so that the firms who do not export incur both a market share and profit loss. The more productive firms who export more than make up for their loss of domestic sales with increased export sales, and the most productive firms among [illegible]

firms and the market share increase of the most productive firms both contribute to an aggregate productivity gain and an increase in welfare.[33]

across firms. In fact, only a portion of the firms—the more efficient ones—reap benefits from trade in the form of gains in market share and profit. Less [illegible]

force the least efficient firms out of the industry. These trade-induced reallocations towards more efficient firms explain why trade may generate aggregate productivity gains without necessarily improving the productive efficiency of individual firms.

Although this model mainly highlights the long-run benefits associated with the trade-induced reallocations within an industry, the reallocation of these resources also obviously entails some short-run costs. It is therefore important to have a model that can predict the impact of trade policy on inter-firm reallocations in order to design accompanying policies that would address issues related to the transition towards a new regime. These policies could help palliate the transitional costs while taking care not to hinder the reallocation process. Of course, the model also clearly indicates that policies that hinder the reallocation process or otherwise interfere with the flexibility of the factor markets may delay or even prevent a country from reaping the full benefits from trade.

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$[1 - G(\varphi)]k(\varphi)$ is monotonically decreasing from infinity to zero on $(0, \infty)$. (This is a sufficient condition for both properties.) Recall that $k(\varphi) = [\tilde{\varphi}(\varphi)/\varphi]^{\sigma-1} - 1$ where

$$\tilde{\varphi}(\varphi)^{\sigma-1} = \frac{1}{1 - G(\varphi)} \int_{\varphi}^{\infty} \xi^{\sigma-1} g(\xi)\, d\xi \tag{B.1}$$

as defined in (9). Thus,

$$\begin{aligned} k'(\varphi) &= \frac{g(\varphi)}{1 - G(\varphi)} \left[\left(\frac{\tilde{\varphi}(\varphi)}{\varphi} \right)^{\sigma-1} - 1 \right] - \left(\frac{\tilde{\varphi}(\varphi)}{\varphi} \right)^{\sigma-1} \frac{\sigma - 1}{\varphi} \\ &= \frac{k(\varphi) g(\varphi)}{1 - G(\varphi)} - \frac{(\sigma - 1)[k(\varphi) + 1]}{\varphi}. \end{aligned}$$

Define

$$j(\varphi) = [1 - G(\varphi)]k(\varphi). \tag{B.2}$$

Its derivative and elasticity are given by

$$j'(\varphi) = -\frac{1}{\varphi}(\sigma - 1)[1 - G(\varphi)][k(\varphi) + 1] < 0, \tag{B.3}$$

$$\frac{j'(\varphi)\varphi}{j(\varphi)} = -(\sigma - 1)\left(1 + \frac{1}{k(\varphi)}\right) < -(\sigma - 1). \tag{B.4}$$

Since $j(\varphi)$ is nonnegative and its elasticity with respect to φ is negative and bounded away from zero, $j(\varphi)$ must be decreasing to zero as φ goes to infinity. Furthermore, $\lim_{\varphi \to 0} j(\varphi) = \infty$ since $\lim_{\varphi \to 0} k(\varphi) = \infty$. Therefore, $j(\varphi) = [1 - G(\varphi)]k(\varphi)$ decreases from infinity to zero on $(0, \infty)$.

APPENDIX C: OPEN ECONOMY EQUILIBRIUM

C.1. *Aggregate Labor Resources Used to Cover the Export Costs*

It was asserted in footnote 22 that the ratio of new exporters to all exporters was δ, and hence that the aggregate labor resources used to cover the export cost did not depend on its representation as either a one time sunk entry cost or a per-period fixed cost. As before, let M_e denote the mass of all new entrants. The ratio of new exporters to all exporters is then $p_x p_{in} M_e / p_x M$. This ratio must be equal to δ as the aggregate stability condition for the equilibrium ensures that $p_{in} M_e = \delta M$.

C.2. *Existence and Uniqueness of the Equilibrium Cutoff Level φ^**

Following is a proof that the FE condition and the new ZCP condition in (20) identify a unique cutoff level φ^* and that this new ZCP curve cuts the FE curve from above in (φ, π) space. These conditions imply $\delta f_e / [1 - G(\varphi^*)] = f k(\varphi^*) + p_x n f_x k(\varphi_x^*)$, or

$$f j(\varphi^*) + n f_x j(\varphi_x^*) = \delta f_e, \tag{C.1}$$

where $\varphi_x^* = \tau (f_x / f)^{1/(\sigma-1)} \varphi^*$ is implicitly defined as a function of φ^* (see (19)). Since $j(\varphi)$ is decreasing from infinity to zero on $(0, \infty)$, the left-hand side in (C.1) must also monotonically decrease from infinity to zero on $(0, \infty)$. Therefore, (C.1) identifies a unique cutoff level φ^* and

APPENDIX D: THE IMPACT OF TRADE

D.1. *Welfare*

[redacted]

level:[35]

$$W_a = M_a^{\frac{1}{\sigma-1}} \rho \tilde{\varphi}_a = \rho \left(\frac{L}{\sigma f} \right)^{\frac{1}{\sigma-1}} \varphi_a^*.$$

[redacted]

Increase in n: Differentiating (C.1) with respect to n and using $\partial\varphi_x^*/\partial n = (\varphi_x^*/\varphi^*)\partial\varphi^*/\partial n$ from (19) yields

$$\frac{\partial\varphi^*}{\partial n} = \frac{-f_x\varphi^* j(\varphi_x^*)}{f\varphi^* j'(\varphi^*) + nf_x\varphi_x^* j'(\varphi_x^*)}. \tag{E.1}$$

Hence $\partial\varphi^*/\partial n > 0$ and $\partial\varphi_x^*/\partial n > 0$ since $j'(\varphi) < 0\,\forall\varphi$ (see (B.4)).

Decrease in τ: Differentiating (C.1) with respect to τ and using $\partial\varphi_x^*/\partial\tau = \varphi_x^*/\tau + (\varphi_x^*/\varphi^*)\partial\varphi^*/\partial\tau$ from (19) yields

$$\frac{\partial\varphi^*}{\partial\tau} = -\frac{\varphi^*}{\tau}\frac{nf_x j'(\varphi_x^*)\varphi_x^*}{f\varphi^* j'(\varphi^*) + nf_x\varphi_x^* j'(\varphi_x^*)} < 0 \tag{E.2}$$

since $j'(\varphi) < 0\,\forall\varphi$, and

$$\frac{\partial\varphi_x^*}{\partial\tau} = -\frac{fj'(\varphi^*)}{nf_x j'(\varphi_x^*)}\frac{\partial\varphi^*}{\partial\tau} > 0.$$

Decrease in f_x: Differentiating (C.1) with respect to f_x and using $\partial\varphi_x^*/\partial f_x = (\varphi_x^*/\varphi^*)\partial\varphi^*/\partial f_x + [1/(\sigma-1)]\varphi_x^*/f_x$ from (19) and $j'(\varphi_x^*)\varphi_x^* = -(\sigma-1)[j(\varphi_x^*) + 1 - G(\varphi_x^*)]$ from (B.2) and (B.4) yields

$$\frac{\partial\varphi^*}{\partial f_x} = \frac{n[1 - G(\varphi_x^*)]}{fj'(\varphi^*) + nf_x j'(\varphi_x^*)(\varphi_x^*/\varphi^*)} < 0$$

since $j'(\varphi) < 0\,\forall\varphi$, and

$$\frac{\partial\varphi_x^*}{\partial f_x} = \frac{-1}{nf_x j'(\varphi_x^*)}\left[nj(\varphi_x^*) + fj'(\varphi^*)\frac{\partial\varphi^*}{\partial f_x}\right] > 0.$$

Welfare: Recall from (D.1) that welfare per worker is given by $W = \rho(L/\sigma f)^{1/(\sigma-1)}\varphi^*$. Welfare must therefore rise with increases in n and decreases in f_x or τ since all of these changes induce an increase in the cutoff productivity level φ^*.

E.2. *Reallocations of Market Shares*

Recall that $r_d(\varphi) = (\varphi/\varphi^*)^{\sigma-1}\sigma f$ $(\forall\varphi \geq \varphi^*)$ in the new open economy equilibrium. $r_d(\varphi)$ therefore decreases with increases in n and decreases in f_x or τ since all of these changes induce an increase in the cutoff productivity level φ^*. Thus $r'_d(\varphi) < r_d(\varphi)$ $\forall\varphi \geq \varphi^*$ whenever $n' > n$, $\tau' < \tau$, or $f'_x < f_x$ (since $\varphi^{*\prime} > \varphi^*$).

The direction of the change in combined domestic and export sales, $r_d(\varphi) + nr_x(\varphi) = (1 + n\tau^{1-\sigma})r_d(\varphi)$, will depend on the direction of the change in $(1 + n\tau^{1-\sigma})/(\varphi^*)^{\sigma-1}$. It is therefore clear that a firm's combined sales will decrease in the same proportion as its domestic sales when since $-\varphi j'(\varphi)/j(\varphi) > \sigma - 1 \; \forall \varphi$ (see (B.4)) and $(\varphi^*)^{\sigma-1} j(\varphi^*)/[(\varphi_x^*)^{\sigma-1} j(\varphi_x^*)] > 1$.[39] Hence,

$$\frac{\partial\left[\frac{1+n\tau^{1-\sigma}}{(\varphi^*)^{\sigma-1}}\right]}{\partial n} = \frac{1+n\tau^{1-\sigma}}{(\varphi^*)^{\sigma-1}}\left[\frac{1}{\tau^{\sigma-1}+n} - (\sigma-1)\frac{\partial \varphi^*}{\partial n}\frac{1}{\varphi^*}\right] > 0.$$

Decrease in τ: From (E.2),

$$\begin{aligned}
-\frac{\partial \varphi^*}{\partial \tau}\frac{\tau}{\varphi^*} &= \left[\frac{f}{nf_x}\frac{\varphi^* j'(\varphi^*)}{\varphi_x^* j'(\varphi_x^*)} + 1\right]^{-1} \\
&= \left[\frac{f}{nf_x}\frac{[1-G(\varphi^*)][k(\varphi^*)+1]}{[1-G(\varphi_x^*)][k(\varphi_x^*)+1]} + 1\right]^{-1} && \text{(using (B.3))} \\
&= \left[\frac{f}{nf_x}\left(\frac{\varphi_x^*}{\varphi^*}\right)^{\sigma-1}\frac{\int_{\varphi^*}^{\infty}\xi^{\sigma-1}g(\xi)\,d\xi}{\int_{\varphi_x^*}^{\infty}\xi^{\sigma-1}g(\xi)\,d\xi} + 1\right]^{-1} && \text{(using (B.1))} \\
&= \left[\frac{\tau^{\sigma-1}}{n}\frac{\int_{\varphi^*}^{\infty}\xi^{\sigma-1}g(\xi)\,d\xi}{\int_{\varphi_x^*}^{\infty}\xi^{\sigma-1}g(\xi)\,d\xi} + 1\right]^{-1} && \text{(using (19))} \\
&< \left[\frac{\tau^{\sigma-1}}{n} + 1\right]^{-1}
\end{aligned}$$

since $\int_{\varphi^*}^{\infty}\xi^{\sigma-1}g(\xi)d\xi/[\int_{\varphi_x^*}^{\infty}\xi^{\sigma-1}g(\xi)d\xi] > 1$ as $\varphi^* < \varphi_x^*$. Hence,

$$\begin{aligned}
\frac{\partial\left[\frac{1+n\tau^{1-\sigma}}{(\varphi^*)^{\sigma-1}}\right]}{\partial \tau} &= \frac{1+n\tau^{1-\sigma}}{(\varphi^*)^{\sigma-1}\tau}\left[\frac{(1-\sigma)n\tau^{1-\sigma}}{1+n\tau^{1-\sigma}} - (\sigma-1)\frac{\partial\varphi^*}{\partial\tau}\frac{\tau}{\varphi^*}\right] \\
&= \frac{1+n\tau^{1-\sigma}}{(\varphi^*)^{\sigma-1}\tau}(\sigma-1)\left[-\frac{\partial\varphi^*}{\partial\tau}\frac{\tau}{\varphi^*} - \left(\frac{\tau^{\sigma-1}}{n}+1\right)^{-1}\right] \\
&< 0.
\end{aligned}$$

E.3. *Reallocations of Profits*

Increase in n: All surviving firms who do not export (with $\varphi < \varphi_x^{*\prime}$) must incur a profit loss since their profits from domestic sales decrease ($r_d'(\varphi) < r_d(\varphi)$) and those who would have exported previously (with the lower n) further lose any profits from exporting. Similarly, the firm with productivity level $\varphi = \varphi_x^{*\prime}$ also incurs a profit loss (although the firm exports, it gains zero

Decrease in τ: As was the case with the increase in n, the least productive firms who do not export (with $\varphi < \varphi_x^{*\prime}$) incur both a revenue and profit loss. There now exists a new category of firms with intermediate productivity levels ($\varphi_x^{*\prime} \leq \varphi < \varphi_x^*$) who enter the export markets as a consequence of the decrease in τ. The new export sales generate an increase in revenue for all these firms, but only a portion of these firms (with productivity $\varphi > \varphi^\dagger$ where $\varphi_x^{*\prime} < \varphi^\dagger < \varphi_x^*$) also increase their profits. Firms with productivity levels $\varphi \geq \varphi_x^*$ who export both before and after the change in τ enjoy a profit increase that is proportional to their combined revenue increase (their fixed costs do not change) and is increasing in their productivity level φ:

$$\begin{aligned}\Delta\pi(\varphi) &= \frac{1}{\sigma}[r'(\varphi) - r(\varphi)] \\ &= \varphi^{\sigma-1} f\left[\frac{1+n(\tau')^{1-\sigma}}{(\varphi^{*\prime})^{\sigma-1}} - \frac{1+n\tau^{1-\sigma}}{(\varphi^*)^{\sigma-1}}\right],\end{aligned}$$

where the term in the bracket must be positive.

E.4. *Changes in Aggregate Productivity*

Any productivity average based on (D.2) must increase when n increases or τ decreases as the new distribution of firm revenues $r'(\varphi)g(\varphi)/R$ first order stochastically dominates the old one $r(\varphi)g(\varphi)/R$: $\int_0^\varphi r'(\xi)g(\xi)\,d\xi \leq \int_0^\varphi r(\xi)g(\xi)\,d\xi$ $\forall\varphi$.[41] Note that this property does not hold when f_x decreases as the revenues of the most productive firms are not higher with the lower f_x. Nevertheless, the productivity average Φ will rise when f_x decreases so long as the new exporters are more productive than the average ($\varphi_x^* > \Phi$).

[redacted]

AW, B. Y., S. CHUNG, AND M. J. ROBERTS (2000): "Productivity and Turnover in the Export [redacted]

HOPENHAYN, H. (1992a): "Entry, Exit, and Firm Dynamics in Long Run Equilibrium," *Econometrica*, 60, 1127–1150.

——— (1992b): "Exit, Selection, and the Value of Firms," *Journal of Economic Dynamics and Control*, 16, 621–653.

KRUGMAN, P. R. (1979): "Increasing Returns, Monopolistic Competition, and International Trade," *Journal of International Economics*, 9, 469–479.

——— (1980): "Scale Economies, Product Differentiation, and the Pattern of Trade," *American Economic Review*, 70, 950–959.

MONTAGNA, C. (1995): "Monopolistic Competition with Firm-Specific Costs," *Oxford Economic Papers*, 47, 318–328.

PAVCNIK, N. (2002): "Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants," *The Review of Economic Studies*, 69, 245–276.

ROBERTS, M. J., T. SULLIVAN, AND J. R. TYBOUT (1995): "Micro-Foundations of Export Booms," Mimeo, World Bank.

ROBERTS, M. J., AND J. R. TYBOUT (1997a): "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs," *American Economic Review*, 87, 545–564.

——— (1997b): *What Makes Exports Boom?* Washington, D.C.: The World Bank.

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References

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The Quarterly Journal of Economics, Vol. 113, No. 3. (Aug., 1998), pp. 903-947.
Stable URL:
http://links.jstor.org/sici?sici=0033-5533%28199808%29113%3A3%3C903%3AILBEIM%3E2.0.CO%3B2-P

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The American Economic Review, Vol. 67, No. 3. (Jun., 1977), pp. 297-308.
Stable URL:
http://links.jstor.org/sici?sici=0002-8282%28197706%2967%3A3%3C297%3AMCAOPD%3E2.0.CO%3B2-%23

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Econometrica, Vol. 60, No. 5. (Sep., 1992), pp. 1127-1150.
Stable URL:
http://links.jstor.org/sici?sici=0012-9682%28199209%2960%3A5%3C1127%3AEEAFDI%3E2.0.CO%3B2-B

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Stable URL:
http://links.jstor.org/sici?sici=0002-8282%28198012%2970%3A5%3C950%3ASEPDAT%3E2.0.CO%3B2-H

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Oxford Economic Papers, New Series, Vol. 47, No. 2. (Apr., 1995), pp. 318-328.
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