GLOBALISATION AND MARKET STRUCTURE*

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First draft August 2002
This version November 18, 2002

Abstract

This paper reviews some puzzling economic aspects of globalisation and argues that they cannot be satisfactorily addressed in perfectly or monopolistically competitive models. Drawing on recent work, a model of oligopoly in general equilibrium is sketched. The model ensures theoretical consistency by assuming that firms are large in their own markets but small in the economy as a whole, and ensures tractability by assuming quadratic preferences defined over a continuum of goods. Applications considered include the effects of trade liberalisation on industrial structure, on cross-border merger waves, and on the distribution of income between skilled and unskilled workers.

JEL: D50, L13, F12

Keywords: Cross-border mergers; GOLE (General Oligopolistic Equilibrium); market integration; trade and wages; trade liberalisation.

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* Presidential address to the European Economic Association, delivered at the Annual Conference in Venice, 22-24 August 2002. I am grateful to Dermot Leahy for valuable discussions, and to participants at conferences in Bergen and Rochester where some of the ideas below were presented. This research is part of the International Trade and Investment Programme of the Institute for the Study of Social Change at University College Dublin.

1. Introduction

"Globalisation" means different things to different people. To Charles Pasqua, a senior French politician, it is "the new totalitarianism of our time".[1] To Anthony Giddens, a distinguished sociologist, it is an anthropologist in rural Africa, hoping for insights into traditional life-styles when she goes to a local home, only to be invited to join in watching *Basic Instinct* on video.[2] To street protestors, it is a catch-all term for everything unpleasant that distinguishes the twenty-first century from its predecessors.

Even in economics, "globalisation" has many interpretations, ranging from the design of international economic institutions to the economics of the internet.[3] In this paper, I want to concentrate on what is probably its core meaning: the increased interdependence of national economies, and the trend towards greater integration of goods and factor markets. My focus is methodological: how should we approach the study of globalisation? My answer is twofold: we will usually want to work with general equilibrium models; and we will often want to work with imperfectly competitive models, so we need to pay careful attention to issues of market structure.

The need for general equilibrium models is not so controversial, though I should explain what I mean by the term. This is not general equilibrium in the style of Arrow and Debreu. If we want to answer real-world questions, we have to trade off generality for tractability. Hence the distinguishing feature of the models I have in mind is not their generality *per se*. With special functional forms and a host of simplifying assumptions, they are anything but general relative to many partial equilibrium models. Rather, their

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[1] "La mondialisation ... nouveau totalitarianisme de notre temps", *Le Monde*, 5 December 1999.

[2] Giddens (1999).

[3] For discussions of some of the policy aspects of globalisation, see Rodrik (1997) and Stiglitz (2002).

distinguishing feature is a focus on interactions between markets: between home and foreign markets, to be sure, but especially between goods and factor markets. For example, one of the central economic puzzles posed by globalisation is whether changes in trade or technology are primarily responsible for recent increases in income inequality in Western economies, and especially for the worsening economic position of unskilled relative to skilled workers. It is surely obvious that addressing this problem requires an approach which is general equilibrium in my sense.

Market structure is another matter. Existing models, assuming either perfect or monopolistic competition, have thrown considerable light on the problems of globalisation. Of course, the assumptions which both variants of competition share are patently unrealistic for most markets: an infinitely elastic supply of atomistic firms that face no barriers to entry or exit and that do not engage in strategic behaviour. But unrealistic assumptions are not in themselves grounds for rejecting a theory. I need to show that alternative models are at least as realistic and generate more plausible predictions. I do this in two ways. In the first place, competitive models have almost nothing to say about the impact of globalisation on market structure itself. An example is the phenomenon of merger waves, especially cross-border ones, such as occurred in the European Union with the completion of the Single Market.[4] To explain this, we need a model that endogenises market structure. In the second place, prices are the only channel through which changes in market conditions impinge on domestic firms in competitive models. Allowing for oligopolistic interaction suggests many other ways in which globalisation can affect domestic markets.

To address these issues, I first take a more detailed look at competitive approaches to globalisation and especially to the trade and wages debate in Section 2. I then turn in

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[4] See European Commission (1996).

Sections 3 and 4 to consider the reasons why there is to date no satisfactory theory of oligopoly in general equilibrium. I review the problems which have held back the development of such a theory, and propose an approach which overcomes them. Only after these preliminaries can I explore the implications of my approach for some of the economic aspects of globalisation: the effects of trade liberalisation on specialisation patterns, on cross-border merger waves, and on wage inequality.

2. Competitive General Equilibrium and its Discontents

At first blush, perfectly competitive general equilibrium in the form of the textbook Stolper-Samuelson theorem seems to give a plausible and parsimonious explanation of recent changes in income distribution. If globalisation means a fall in the relative price of unskilled-labour-intensive imports into the developed countries of the "North", then the theorem predicts that it must lower the wages of unskilled relative to skilled workers there. Of course, there is much more to the Stolper-Samuelson theorem than this. As extended to higher-dimensional competitive models by Ethier (1974) and Jones and Scheinkman (1977), it implies an important lesson for globalisation: almost any exogenous change yields both winners and losers, in the sense that at least one factor will always gain and at least one other always lose in real terms. So market forces cannot be relied upon to deliver Pareto-improving changes. However, in its original setting of two factors and two sectors, the theorem is overwhelmingly rejected by the evidence. For one thing, it predicts that the rise in skilled wages should encourage a fall in the ratio of skilled to unskilled labour used in all sectors. For another, when run in reverse it implies that the higher export prices enjoyed by the less developed countries of the "South" should *increase* relative unskilled wages there. Neither prediction

accords with the empirical evidence.[5] To paraphrase Robbins (1996), "Stolper-Samuelson hits facts: Facts win".

These problems can be overcome without abandoning perfect competition by allowing for multi-stage production. Feenstra and Hanson (1996) and Jones (2002) have shown that price changes may encourage Northern firms to fragment, relocating or out-sourcing to the South those stages of production which are relatively unskilled-labour-intensive in the North but relatively skilled-labour-intensive in the South. As a result, the relative demand for skilled labour increases, raising skill intensities as well as skill premia, in both exporting and importing countries. This approach resolves one set of puzzles. However, like the Stolper-Samuelson approach, it is vulnerable to a critique of Krugman (1995): import prices and trade volumes have not changed enough to explain the large changes in income distribution which have taken place. This is especially true of North-South trade. Imports from developing countries still constitute a small proportion of total EU and U.S. imports, which in turn are small relative to GNP.

The failure to provide a fully satisfactory trade-based explanation for changes in wage inequality might simply mean that trade is not the culprit. That leaves changes in technology as the residual claimant to explanatory power, and there is no shortage of technology-based explanations of changes in relative wages, whether movements along the technological frontier, such as changes arising from capital-skill complementarity (Krusell et al. (2000)), or outward shifts of it, such as computerisation (Autor, Katz and Krueger (1998)) or, more generally, changes in general-purpose technologies (Aghion, Caroli and Garcia-Penalosa (1999)). But just as it would be foolish to deny the importance of the huge changes in technology in recent decades, it is surely premature to argue that globalisation has had nothing

[5] See Desjonqueres, Machin and van Reenan (1999) and Haskel (1999).

to do with rising wage inequality. Moreover, once we leave the perfectly competitive paradigm, a number of alternative ways in which trade can affect domestic labour markets are suggested.

First, trade and technology are not necessarily competing explanations. For example, Acemoglu (1999), Dinopoulos and Segerstrom (1999) and Thoenig and Verdier (2002) show how trade liberalisation can induce skill-biased technological progress in models with endogenous innovation. These models can be seen as formalising the arguments of Wood (1994) that increased trade encourages labour-saving "defensive innovations". Second, we should not focus only on North-South trade. There is some empirical evidence that changes in North-North trade can have greater effects on wage inequality.[6] This is consistent with theoretical work by Dinopoulos, Syropoulos and Xu (2000) and Ekholm and Midelfart Knarvik (2000), who show how trade liberalisation in monopolistically competitive industries can raise skill intensity either by inducing changes in firm scale or by encouraging a shift from traditional to modern (i.e., skill-intensive) firms. Finally, all these papers too are vulnerable to the Krugman critique. In the words of Leamer (2000), the "news" about changes in foreign competition reaches Northern markets only via prices. But once we leave the realm of competitive equilibrium, non-price competition and strategic interactions provide a host of alternative channels whereby firms can interact without significant changes in prices or trade volumes. To explore these issues, we need a model of general oligopolistic equilibrium, or "GOLE". Such a model has been a goal of theorists for decades but remains elusive. In the next sections I turn from globalisation to theory in order to consider why this is so and what can be done about it.

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[6] See, for example, Greenaway, Hine and Wright (1999).

3. Pitfalls on the Road to General Oligopolistic Equilibrium

The problems of modelling oligopoly in general equilibrium can be simply stated.[7] We want firms to be large enough to influence the price of their output and smart enough to behave strategically against their rivals. But then they should also take account of their ability to affect their profits in other ways. To the extent that they can influence the factor prices they face, they should exercise monopsony power. Moreover, to the extent that their pricing decisions can influence national income and hence shift the demand function for their output, a phenomenon sometimes called the "Ford effect", they should take this too into account.

Matters are even more complicated when we consider what it is that firms are trying to maximise. Unlike competitive firms, oligopolistic ones can affect the purchasing power of their profits. Taken literally, this suggests that their behaviour should be affected by the choice of numeraire, or, more generally, the normalisation rule for prices: a bizarre feature of an economic model. Since Gabszewicz and Vial (1972), one response to this has been to assume that firms maximise not profits but utility, or, as in Dierker and Grodal (1998), shareholders' real wealth. But this requires that each firm calculate the full general equilibrium of the whole economy in making its decisions. Finally, even if firms merely maximise profits and we ignore the numeraire problem, Roberts and Sonnenschein (1977) have shown that profit functions may not be quasi-concave, in which case pure strategy equilibria may not exist.

4. Large in the Small and Vice Versa

Given all the difficulties of modelling oligopoly in general equilibrium which I have

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[7] See Hart (1985) for a review and Neary (2003) for further references.

summarised, it is not surprising that the literature on the topic is tiny, especially compared to the enormous literature on monopolistic competition in general equilibrium. Yet all these difficulties stem from a single assumption: that firms are large in the economy as a whole. This assumption does not even have the defense that it is very realistic. It may be true that many firms have some monopsony power, at least in local labour markets. But as a first step, it seems reasonable to abstract from this. As for the Ford effect, it is hard to think of any individual firm which could exercise such powers in modern diversified economies. Faced with a central assumption which is both troublesome and unrealistic, it makes sense to drop it, which leads to the key idea I want to explore.

Logically, if I want to assume that firms are large in their own sectors, but small in the economy as a whole, then the sectors themselves must be small. The route to modelling this is one that has already been widely used since it was introduced by Samuelson (1964): a continuum of sectors, with economy-wide factor markets. Almost all previous authors have assumed that each sector is either perfectly competitive, with implicitly its own continuum of firms; or monopolised by a single firm whose output is an imperfect substitute for the outputs of all other firms, so the whole group of sectors comprises a monopolistically competitive industry. By contrast, I allow for a small number of firms in each sector, with entry either impossible or restricted, and with perceived interdependence between firms leading them to engage in strategic behaviour.

Taking this approach resolves all of the difficulties I outlined in the last section. If firms are small in all markets other than their own, they take factor prices and national income as fixed in making their decisions. So, they can neither exercise monopsony power nor benefit from the Ford effect. As for profits, those of any one firm constitute a negligible fraction of aggregate purchasing power, so the objective of maximising them is no less

plausible than it is in competitive models. The fact that profits are actually earned in equilibrium does not complicate matters, provided we assume they are costlessly redistributed to a single aggregate consumer: a strong assumption, but not peculiar to this area. Finally, though existence of equilibrium in general may be problematic, there is no reason to believe that it will be less likely than in comparable competitive models, provided the requirements for existence in partial equilibrium are fulfilled.

I hope to convince you that this idea has promise in making possible a tractable but consistent theory of oligopoly in general equilibrium. Of course, it has many precursors. Viewing firms as small in the whole economy but possessing monopoly power in their own market is the essence of the models of monopolistic competition in general equilibrium which I have already discussed. So my approach owes a great deal to that of Dixit and Stiglitz (1977), and in particular to the clarification of its theoretical underpinnings provided by d'Aspremont, Dos Santos Ferreira and Gérard-Varet (1996). Models with more than one firm per sector and some degree of strategic interaction have been explored by a number of authors, including Hart (1982), Shleifer (1986), Murphy, Shleifer and Vishny (1989) and Rotemberg and Woodford (1992). However, in the details of market structure and in their specific applications these papers are very different from mine. Above all, they were not primarily concerned with my objective of building a bridge between the theory of industrial organisation and general equilibrium analysis. In the remainder of this paper I want to sketch how this can be done.

5. Specifying Demand

As discussed in the previous section, the key conceptual step in my approach is to view firms as large in their own sector but small in the economy as a whole. The key

technical step in implementing this approach is to find a tractable specification of preferences. In principle any additively separable specification of preferences will do, since additive separability implies what Browning, Deaton and Irish (1985) call "Frisch demands": the inverse demand for each good depends only on its own consumption and on the marginal utility of income. Assume a representative consumer with an additively separable utility function defined over a continuum of goods:

$$U[\{x(z)\}] = \int_0^1 u[x(z)]dz, \qquad u'>0, \quad u''<0 \tag{1}$$

Utility is maximised subject to the budget constraint:

$$\int_0^1 p(z)x(z)dz \leq I \tag{2}$$

where I is aggregate income. The first-order conditions give the inverse demand functions for the output of each sector z:

$$p(z) = \frac{1}{\lambda}u'[x(z)] \tag{3}$$

where λ is the marginal utility of income, the Lagrange multiplier attached to the budget constraint.

All this is well known, and has been used in a variety of fields. However, almost all previous applications have in common that they use one or other device to get rid of λ. Thus in stochastic consumption theory, where $x(z)$ denotes the consumption in period z, the implicit demands for two adjacent periods can be combined. Eliminating λ gives the Euler equation. Alternatively, in the theory of industrial organisation (and its applications to trade and other fields), specifications such as (1) are typically combined with a "numeraire" good to give quasi-linear preferences: $U = x_0 + \int_0^1 u[x(z)]dz$. The value of λ is then one, so (3) provides

a secure foundation for partial equilibrium analysis.[8]

By contrast, I want to argue that, when λ is kept explicit, the demand functions in (3), combined with the continuum assumption, make possible a consistent but tractable theory of imperfect competition in general equilibrium. Previous attempts at developing such a theory have worked either with "subjective" or "objective" demand curves: the former, as in Negishi (1961), perceived by firms; the latter, as in Gabszewicz and Vial (1972) and Roberts and Sonnenschein (1977), derived explicitly from utility maximisation. Equation (3) reconciles these two approaches. On the one hand, bearing in mind that λ is endogenous, equation (3) gives the objective demand functions directly. On the other hand, firms take λ as given, quite rationally since their own infinitesimal scale makes them impotent to affect it. Hence (3) with λ fixed also gives the subjective demand functions perceived by firms. The demand for good z depends on variables outside sector z only through the marginal utility of income, which therefore serves as a "sufficient statistic" for the rest of the economy in each sector.

While any additively separable utility function gives the sufficient statistic property, the general sub-utility function, $u[x(z)]$, is not tractable, not least because in general the marginal utility of income cannot be written in closed form. Hence we need to consider some special cases. Constant-elasticity-of-substitution or Dixit-Stiglitz preferences are an obvious candidate, since they lead to iso-elastic perceived demand curves. Such preferences have provided the foundation for the myriad applications of monopolistic competition. However, in oligopoly models, iso-elastic demands are less convenient. For example, they imply that outputs are often strategic complements in Cournot competition, and reaction functions are not well-behaved. Hence I have chosen to work with a different specification of preferences.

Following Neary (2002d) therefore, consider the case where each sub-utility function

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[8] See, for example, Spence (1976), Vives (1985) and Ottaviano, Tabuchi and Thisse (2002).

is quadratic:

$$u[x(z)] \quad = \quad ax(z) - \tfrac{1}{2}bx(z)^2 \qquad \textbf{(4)}$$

Now the inverse demand functions and the marginal utility of income are:

$$p(z) \quad = \quad \tfrac{1}{\lambda}[a - bx(z)] \qquad \text{and} \qquad \lambda[\{p(z)\},I] \quad = \quad \frac{a\mu_p - bI}{\sigma_p^2} \qquad \textbf{(5)}$$

where μ_p is the mean of prices and σ_p^2 is their (uncentred) variance. Hence, a rise in income, a rise in the (uncentred) variance of prices, or a *fall* in the mean of prices, all reduce λ and so shift the demand function for each good outwards. Firms, however, take λ as fixed, and so the perceived or subjective inverse demand curves are linear, as in Negishi (1961). Oligopoly models with linear demand functions are easy to solve in partial equilibrium, which allows us to construct a tractable but consistent model of oligopoly in general equilibrium.

It might be objected that a linear demand system does not provide a very general foundation for a model of general equilibrium. The point is well taken, but we have to start somewhere, and I hope to show that this approach leads in interesting directions. It also has other desirable properties. For example, as I show in Neary (2002d), the quadratic specification in (1) and (4) is a special case of the Gorman polar form. (See Gorman (1961).) Hence it aggregates perfectly over different countries, provided they have the same *b* parameter.

6. Oligopoly in General Equilibrium

The specification of preferences discussed in the last section could be combined with a wide range of assumptions about the supply side of the economy. I begin with a particularly simple set-up. Let each of the infinite number of goods be produced by a small

number of firms. I assume the simplest form of oligopolistic interaction in each sector, one-stage homogeneous-product Cournot competition with an exogenous number of firms. Since the number of firms is exogenous for the present, little is lost by assuming for convenience that it is the same in each sector. As for technology and factor markets, I assume the simplest Ricardian specification: labour is the only factor of production, returns to scale are constant, and labour is used with different efficiency levels across sectors and countries. Finally, all income (including profits and tariff revenue, if any) accrues to the aggregate household and is spent on current consumption.

To discuss globalisation I need to consider at least two countries. However, it is helpful to digress and, drawing on Neary (2003), to consider first the case of a single country. This allows me to show how equilibria can be calculated in these models, and it also throws an interesting light on competition policy in general equilibrium.

The first-order condition for a typical firm in sector z is: $p(z)-c(z)=b\lambda^{-1}y(z)$, where $p(z)$, $c(z)$ and $y(z)$ denote the price, unit cost and output per firm in sector z respectively. Eliminating $p(z)$ from (5), and setting demand $x(z)$ equal to supply $ny(z)$, we can solve for equilibrium firm output:

$$y(z) = \frac{a - \lambda c(z)}{b(n+1)} \qquad \textbf{(6)}$$

The unit cost of production in each sector, $c(z)$, equals the economy-wide wage rate, w, times the sector's labour requirement per unit output, denoted by $\alpha(z)$: $c(z)=w\alpha(z)$. The equilibrium condition in the labour market requires that the exogenous labour supply L equal the total demand for labour from all sectors:

$$L = \int_0^1 \alpha(z) n y(z) dz \qquad \textbf{(7)}$$

Inspecting equations (6) and (7) shows that they are homogeneous of degree zero in two nominal variables, the wage rate *w* and the *inverse* of the marginal utility of income, λ^{-1}.[9] As is normal in real models, the absolute values of these variables are indeterminate, and, indeed, uninteresting. Hence we can choose an arbitrary numeraire. (This will be a *true* numeraire: unlike the cases discussed in Section 3, the choice of numeraire has no implications for the model's properties.) It is most convenient to choose utility itself as the numeraire and set λ equal to one. Hence from now on nominal wages and all other nominal variables are measured in utility units or "utils".

To solve the model, note that equations (6) and (7), with the definition of $c(z)$, combine to give a single equation in a single unknown, *w*. Solving this by evaluating the integral in (7) gives:

$$w = \left[a\mu - \frac{n+1}{n} bL\right] \frac{1}{\sigma^2} \qquad \textbf{(8)}$$

where μ and σ^2 denote the first and second moments of the technology distribution:

$$\mu \equiv \int_0^1 \alpha(z)\,dz \qquad \text{and} \qquad \sigma^2 \equiv \int_0^1 \alpha(z)^2\,dz \qquad \textbf{(9)}$$

Equation (8) implies that an increase in the number of firms in all sectors, a crude but convenient way of modelling competition policy, raises the wage. It can also be shown that profits fall, so competition policy has the expected effects on income distribution.

We can also consider the effects of competition policy on welfare, since the specification of preferences implies an explicit welfare criterion. Substituting the direct demand functions from (5) into the direct utility function gives the indirect utility function

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[9] A standard implication of additive preferences is that demands are homogeneous of degree zero in prices and λ^{-1}: see Browning, Deaton and Irish (1985). Here I have replaced the infinite number of prices with the economy-wide wage *w*.

(ignoring a constant):

$$\tilde{U} = a^2 - \sigma_p^2 \qquad \textbf{(10)}$$

So welfare is inversely related to the second moment of the distribution of prices. This in turn can be shown to equal:[10]

$$\sigma_p^2 = \frac{a^2}{(n+1)^2}\frac{v^2}{\sigma^2} + (a\mu - bL)^2\frac{1}{\sigma^2} \qquad \textbf{(11)}$$

where v^2 denotes the variance of the technology distribution: $v^2 = \sigma^2 - \mu^2$. Equation (11) is decreasing in the number of firms, implying that competition policy raises welfare. Since there are no other distortions in the model, we would expect this to be so. But notice one surprising feature: welfare is strictly increasing in n only if v^2 is strictly positive. When v^2 is zero, all sectors have the same technology parameter, and equation (11) shows clearly that in this *featureless economy*, competition policy has no effect on welfare: $d\tilde{U}/dn=0$. This shows the importance of a general-equilibrium perspective, and formalises a neglected insight of Lerner (1933-34). If we want to evaluate the effectiveness of competition policy which is applied to all sectors in the economy, then we need to focus on *differences* in the degree of imperfect competition between sectors. If all sectors are equally oligopolised and the aggregate labour supply is fixed, then encouraging entry will redistribute income from profits to wages but will not change aggregate welfare.

7. Trade Liberalisation and Industrial Structure

Now, back to globalisation. From here on, I use mostly geometric tools of exposition,

[10] See Neary (2003) for technical details and further discussion.

and refer to my other papers for technical details and formal proofs.[11] In this section and the next, I consider a two-country world in which each country is similar in structure to the closed economy of the last section. Call the two countries "home" and "foreign", with asterisks denoting foreign variables, and over-bars denoting variables pertaining to the world as a whole. All nominal variables are measured in utils, with the world marginal utility of income set equal to one by choice of units.

I begin with the determination of equilibrium in a single international oligopolistic industry, indexed by z. I assume that there are no transport costs or other barriers to international trade, and that firms view the world market as a fully integrated one. As before, the inverse demand function is given by (5), with λ taken as fixed by firms. I assume a given number n of home firms, all of which have the same marginal cost $c(z)$, so all home firms have the same equilibrium output, denoted by $y(z)$. Similarly, there is a given number n^* of foreign firms, all with the same marginal cost $c^*(z)$ and the same equilibrium output $y^*(z)$. Total sales equal the sum of total production by home and foreign firms: $x(z) = ny(z)+n^*y^*(z)$.

To illustrate the implications for whether home firms produce positive levels of output, consider Figure 1. This is drawn in the space of home and foreign marginal costs, $c(z)$ and $c^*(z)$, assuming given values of n and n^*. Suppose first that foreign firms do not produce. The output of a typical home firm is then given by the autarky expression (6). Hence, since operating profits are proportional to output, home firms are profitable provided $c(z)$ is below a.[12] Now suppose instead that all n^* foreign firms produce at a positive output level. The

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[11] The model is introduced and applied to some classic trade issues in Neary (2002d). Neary (2002c) presents a geometric exposition, on which I draw in this section. Neary (2002a) and (2002e) explore the implications for the effects of trade on income inequality and on cross-border mergers, respectively.

[12] From the firms' first-order condition, $p(z)-c(z)=by(z)$, operating profits, $[p(z)-c(z)]y(z)$, equal $by(z)^2$. I ignore fixed costs until Section 9.

output of a typical home firm is then:

$$y(z) = \frac{a - (n^* + 1)c(z) + n^* c^*(z)}{b(n + n^* + 1)} \qquad \textbf{(12)}$$

In this case, home firms are unprofitable unless $c(z)$ is below $[a+n^*c^*(z)]/(n^*+1)$. This defines a threshold locus, the upward-sloping line separating the *F* and *HF* regions in Figure 1. Taken together, these two profitability constraints imply that home firms are profitable only when $c(z)$ lies below both this locus and a; i.e., in the regions labelled *HF* and *H*.

Combining these conditions with similar restrictions on the foreign firms, the possible equilibria are as illustrated in Figure 1. If both home and foreign marginal costs exceed a, in the *O* region, then no firms serve the market. Otherwise the market may be served by firms from one or both countries, depending on the configuration of marginal costs. Inspecting the diagram shows that the size of the *HF* region, in which both home and foreign firms are viable, contracts as the number of firms in either country rises. In the competitive limit, when both n and n^* approach infinity, the region collapses to the 45° line.

Next I want to extend this sectoral analysis to general equilibrium. Assume the same Ricardian production structure as in the previous section, but now with international differences in technology. Marginal costs in each sector thus depend on the labour input coefficients $\alpha(z)$ and $\alpha^*(z)$, and on the wage rates in both countries, w and w^*:

$$c(z) = w\alpha(z), \qquad c^*(z) = w^*\alpha^*(z) \qquad \textbf{(13)}$$

I assume that sectors can be ranked unambiguously such that the home country is more

efficient in producing goods with low values of z.[13] For given wage rates, the distribution of costs in the two countries can therefore be illustrated by a locus such as the downward-sloping line in Figure 2. In the case shown, there are two threshold sectors, $\tilde{z}$ and $\tilde{z}^*$. All sectors for which z is less than $\tilde{z}$ are competitive in the home country, while all sectors for which z is greater than $\tilde{z}^*$ are competitive in the foreign country. Hence, home and foreign firms coexist in sectors between $\tilde{z}^*$ and $\tilde{z}$. It is also possible for one or both countries to produce all goods, in which case either $\tilde{z}$ equals one and/or $\tilde{z}^*$ equals zero. Formally these threshold sectors are defined by two pairs of complementary slack inequalities:[14]

$$\begin{cases} y(\tilde{z}, w, w^*) \geq 0 \\ \quad\; \tilde{z} \leq 1 \end{cases} \qquad \begin{cases} y^*(\tilde{z}^*, w^*, w) \geq 0 \\ \quad\; \tilde{z}^* \geq 0 \end{cases} \qquad \textbf{(14)}$$

(where the signs beneath the arguments denote the signs of the corresponding partial derivatives).

The model is closed by the requirement that the labour market must clear in both countries. This can be written in shorthand form as follows (where the details resemble equation (7), extended to allow for the fact that in each country labour is demanded both by sectors which face competition from abroad and by those which do not):

$$L = L(w, w^*, \tilde{z}) \qquad \text{and} \qquad L^* = L^*(w^*, w, \tilde{z}^*) \qquad \textbf{(15)}$$

Combined with (14), these give four equations in the four unknowns w, w^*, $\tilde{z}$ and $\tilde{z}^*$.

In a competitive model, at most one sector can operate in both countries in

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[13] Formally, the assumption needed is that $y(z)$ is decreasing in z and that $y^*(z)$ is increasing in z. Sufficient conditions for this are that $c(z)$ is increasing in z and that $c^*(z)$ is decreasing in z. It is convenient to draw the locus relating $c(z)$ and $c^*(z)$ as a straight line, but nothing hinges on this. Further details are given in Neary (2002d).

[14] The function $y(z,w,w^*)$ is given by (12), with a corresponding expression for $y^*(z,w^*,w)$.

equilibrium, corresponding to the knife-edge case where $c(z)=c^*(z)$. In oligopoly, by contrast, high-cost firms are not necessarily driven out of business. Trade liberalisation thus wipes out some sectors where high-cost firms cannot compete. But firms which are less efficient than foreign rivals can survive, which is not true in perfect competition.

8. Cross-Border Mergers

In this section I want to extend the model of the previous section to show how trade liberalisation can lead to cross-border merger waves. This may seem like a strong claim, since oligopoly theory has difficulty explaining why firms engaged in Cournot competition would want to merge, in the absence of cost savings. What is sometimes called the "Cournot merger paradox" is due to Salant, Switzer and Reynolds (1983), who showed that mergers between identical firms are unprofitable unless the merged firms produce a very high proportion of pre-merger industry output: over 80% when demand is linear. Subsequent work has shown that mergers may be profitable if Cournot competition is extended in various ways, such as allowing cost synergies, convex demand, owner-manager delegation, or union wage bargaining. It has also shown that the opposite problem, of too many mergers rather than too few, holds in Bertrand competition.[15] However, it has not overturned the original Salant-Switzer-Reynolds result.

The key to the prediction of mergers in my framework is not general equilibrium *per se*, but rather cost differences between firms. The two go together, since in partial equilibrium there is usually no plausible basis for assuming firm heterogeneity. By contrast, in a two-country context, international differences in technology provide a natural reason for

[15] From a large literature, see Deneckere and Davidson (1985), Faulí-Oller (1997), Horn and Persson (2001), Lommerud and Sørgard (1997) and Perry and Porter (1985).

it. It turns out that such differences generate incentives for bilateral mergers; more specifically, they generate incentives for takeovers, since mergers are profitable only in one direction: namely, when a low-cost firm acquires a high-cost one.

To see this, return to the model of the last section, and ask what are the incentives for a foreign firm to acquire a home one. The immediate gain from such a transaction is the increase in operating profits for the foreign firm, less the cost of acquiring the home one, which I assume equals its initial profits. Using subscripts "*0*" and "*1*" to denote the pre- and post-takeover situations respectively, the gain is:

$$\begin{aligned} G_{FH} &\equiv \pi_1^* - \pi_0^* - \pi_0 \\ &= (y_1^*)^2 - (y_0^*)^2 - (y_0)^2 \end{aligned} \qquad \textbf{(16)}$$

where the second line follows from footnote 12 (with *b* set equal to unity for convenience). Assume for the present that wages can be taken as exogenous. (Of course, this is always true for an individual firm contemplating a takeover. If many takeovers take place, then wages will be affected in general equilibrium. I defer consideration of this.)

Equation (16) provides some intuition for the Salant-Switzer-Reynolds result: if the two participating firms have the same costs, and hence the same initial outputs, the profits of the acquiring firm (and of all firms like it) would have to double for a takeover to be profitable. However, I show in Neary (2002e) that there is a range of costs within which the gain is strictly positive. The reason for this is that outputs are strategic substitutes in Cournot competition, at least when demands are linear. (See Gaudet and Salant (1991) for further discussion.) Hence, a takeover which closes down one firm raises operating profits for all surviving firms (including the acquiring firm). Provided the cost differential is sufficiently great, a low-cost foreign firm can afford to acquire a high-cost home one. The region within which this is possible is indicated in Figure 3. Within it, high-cost home firms can earn

positive profits, but are vulnerable to a bilateral takeover by low-cost foreign rivals. An exactly symmetric argument shows that there is a similar region in Figure 3 in which high-cost foreign firms can earn positive profits, but are vulnerable to a bilateral takeover by low-cost home rivals.

Next, staying in partial equilibrium for the present, we can ask what will be the effect of such a bilateral takeover on the incentives for further takeovers in the same industry. Because all outputs are strategic substitutes, the outputs, and hence the profits, of all surviving firms, both home and foreign, increase. Moreover, with linear demands, the outputs of all surviving firms rise by the *same* amount. But the low-cost foreign firms have larger output to begin with. Hence, since profits are proportional to the square of output, a further takeover increases their profits by *more*. Formally, as I show in Neary (2002e), G_{FH} is decreasing in n: so, a fall in n as a result of a takeover raises the incentive for a further takeover. This is the basis for the prediction of merger waves. A profitable takeover of a first home firm by a foreign firm increases the gain to a takeover of one of the remaining home firms by a foreign firm in the same sector.

So far, I have been careful to talk only about incentives for mergers. While it is plausible to conclude that an increase in G_{FH} will raise the probability of a takeover, a positive value of G_{FH} does not by itself guarantee that a takeover will take place. In the real world there are many reasons why takeovers which promise net gains may not take place (especially if the gains are small): transactions costs, uncertainty, not to mention managerial hubris. In the model there is a further consideration: as is well known, profitable mergers which do not yield cost savings exhibit an "after-you" syndrome. For example, from a group of identical large firms, all face the same takeover incentive G_{FH}, but uninvolved firms reap the gains, $\pi_1^*-\pi_0^*$, without having to incur the cost of acquiring the target firm, π_0. Hence no

one firm may opt to engage in a takeover, if it believes that it will earn higher profits by delaying.

However, to explore the general equilibrium repercussions, I need to be specific about which takeovers will occur. Here I take the simplest approach (leaving complications to Neary (2002e)) and assume that *all ex post profitable bilateral takeovers will take place*. I thus ignore the "after-you" problem. I also assume that multilateral negotiations face prohibitive transactions costs, so *only* bilateral takeovers can occur. In the *HF* region in Figure 3, bilateral mergers would be profitable if there were fewer high-cost firms, i.e., if some bilateral mergers had already taken place. But given the initial number of high-cost firms, the first bilateral takeover is not profitable, and so a merger wave is not initiated. Putting this differently, merger waves take place at the intensive but not at the extensive margin. Finally, my assumption is that only *ex post* profitable takeovers will take place. This implies that firms anticipate the wage changes which the economy-wide takeovers will induce. So, the final step is to solve for the change in wages.

To simplify matters, I concentrate on the case, illustrated in Figures 3 and 4, of symmetric countries. Hence, in some sectors, high-cost firms in the home country are bought out by low-cost foreign rivals, while in other sectors the converse happens. In both countries there are expanding and contracting sectors. However, at the initial wages, expanding firms grow by only a fraction of the outputs of the firms which are taken over.[16] Aggregating over all sectors, the total demand for labour contracts in both countries. Assuming labour markets are perfectly flexible, wages are bid down, which raises the profitability of marginal high-cost firms, putting them out of reach of takeovers. As illustrated in Figure 4, the cost

[16] The fraction is the inverse of the initial number of firms in both countries: $y^{*1}-y^{*0} = y^{0}/(n+n^{*})$. See Neary (2002e) for details.

locus shifts down, and so the general-equilibrium repercussions working through labour markets dampen, though they cannot reverse, the tendency towards merger waves.

In summary, at least in the case of symmetric countries, cross-border mergers serve as "instruments of comparative advantage" in both the positive and normative senses. They facilitate more specialisation in the direction of comparative advantage, so moving production and trade patterns closer to what would prevail in a competitive Ricardian world. And, by putting downward pressure on wages, they reduce the variance of prices and so may increase the gains from trade in both countries. All this despite the fact that the sectors in which mergers occur become less competitive, and the distribution of income tilts towards profits at the expense of wages in both countries.

9. Competitive Pressures and Wage Inequality

The model of the last section predicted that merger waves induced by trade liberalisation would shift the distribution of income in favour of profits at the expense of wages. However, most discussions of the effects of globalisation on income distribution have focused on a different margin, that between skilled and unskilled wages. Here I present a variant of the model of the last section which suggests some novel perspectives on this issue.

I retain many of the features already introduced: demands are linear from the perspective of firms, which is rationalised in general equilibrium by continuum-quadratic preferences; and firms in each sector play a two-stage game, with Cournot competition at the second stage. One major difference is that the decision at the first stage is not whether to engage in a takeover but how much to invest, where the return to investment comes in the form of reduced marginal production costs. Second, I now allow for two types of labour, skilled and unskilled, with variable aggregate supplies. As in the papers mentioned in Section

2, I assume that investment requires only skilled labour and production requires only unskilled. Third, I assume that national markets are segmented, and that firms must pay a per-unit premium *t* on each unit sold in their foreign market, which can represent either tariffs or transport costs. (I return to this later.) Finally, I simplify in a number of respects: I abstract from inter-sectoral differences; I assume that home and foreign firms have access to the same technology; I assume that the two countries are identical, since I want to focus on the effects of North-North trade; and I assume only one home and one foreign firm in each sector, with investment and output decisions for both markets taken separately.

Consider first the equilibrium in a single sector in the home country. The profits of a typical home firm in its home market (suppressing the sectoral index *z* for convenience) are:

$$\pi = py - rs - wl \qquad \textbf{(17)}$$

where *r* and *s* denote the wage and the employment level of skilled labour, respectively. The firm's unskilled labour requirement is proportional to output as in previous sections. The new feature is that the factor of proportionality can be reduced by prior investment, which in turn requires skilled labour. Assuming quadratic costs of investment, the firm's technology is:

$$l = \alpha y, \qquad \alpha = \alpha_0 - \theta k, \qquad k = (2s)^{1/2} \qquad \textbf{(18)}$$

In partial equilibrium it is convenient to treat investment and output as the firm's decision variables, so rewrite profits as:

$$\pi = (p - w\alpha)y - \tfrac{1}{2}rk^2 \qquad \textbf{(19)}$$

A similar expression applies to the foreign firm's profits on its sales in the home market:

$$\pi^* = (p - t - w\alpha)y^* - \tfrac{1}{2}rk^{*2} \qquad \textbf{(20)}$$

The foreign firm faces a sales cost *t* per unit; but, since the two countries are identical, it pays

the same factor prices as the home firm.

Since I am interested in responses to changes in the external environment, it is natural to consider a simultaneous-move game, unlike the literature on entry-deterrence, where it is natural to assume that the home firm has a first-mover advantage. In a sub-game perfect equilibrium with both firms active, each firm has an incentive to behave strategically, over-investing (relative to the cost-minimising level) in order to reduce its rival's output.[17] The first-order condition for investment by the home firm is:

$$k = \mu\theta\omega y \qquad \textbf{(21)}$$

where ω is the ratio of unskilled to skilled wages, w/r. Equation (21) shows that the level of investment is directly related to output by three parameters, representing strategic behaviour, technology, and factor prices respectively. The strategic parameter μ equals one when the firm does not behave strategically and $4/3$ when it does. Combining (21) with the home firm's first-order condition for output, we can derive two reaction functions in output space, one assuming that the firm invests strategically and the other that it does not. They are illustrated in Figure 5 by the lines MH' and HH' respectively. (Only sub-game perfect two-stage Nash equilibria are considered, but the "non-strategic" reaction function is a useful expository device. All this is justified in the Appendix, drawing on Neary (2002a)).

To see the implications for trade liberalisation, consider a sequence of two-stage games with progressively lower values of the access cost t facing the foreign firm. Start with the case where t is initially too high to enable it to serve the home market: in Figure 5, its reaction function in output space is shown as FF'. The home firm is thus an unconstrained monopolist and has no need to engage in strategic investment. Its non-strategic reaction

[17] See for example, Spencer and Brander (1983) and Fudenberg and Tirole (1984).

function is shown as MH' (with μ equal to one), and equilibrium monopoly output is given by point M.

Now, suppose that a fall in t allows the foreign firm to compete at lower cost in the home market. Its reaction function shifts rightwards, as indicated by the horizontal arrow. If it shifts far enough that point F lies above point M, then the home firm has an incentive to invest strategically. Provided foreign costs do not fall far enough to shift the foreign firm's reaction function beyond the point H, the foreign firm does not invest in equilibrium while the home firm invests just enough that the foreign firm's equilibrium output is zero. Suppose, however, that t falls even further, so that the foreign reaction function becomes ff'. This lies outside HH', the home firm's reaction function when it invests strategically in a duopoly. Now, the home firm no longer finds it profitable to invest at a level which sets the foreign firm's output to zero. Imports then occur, and the equilibrium is a duopoly with positive levels of strategic investment by both firms. In Figure 5, the locus of equilibria as trade costs fall is indicated by a thick line. The most interesting feature of this model is that, for foreign cost levels which lead the foreign firm's reaction function to meet the y axis in the range MH, no imports occur, even though the *threat* of imports encourages the home firm to produce with a higher ratio of investment to output.

It is easy to see the general equilibrium implications of this. From (18), each firm's demand for skilled labour increases with its investment. The demand for unskilled labour may rise or fall, depending on whether the substitution or output effect dominates. However, the relative demand for skilled labour must rise. Since this happens in all import-competing firms throughout the economy, it feeds back onto factor markets. If aggregate factor supplies are fixed, as in Section 6, then all the adjustment is borne by factor prices. It is more plausible to assume that the relative supply of skilled labour is increasing in the skill

premium, r/w. This may reflect a static trade-off between work and leisure; alternatively, it may correspond to the steady state of a dynamic process of skill acquisition as in Findlay and Kierzkowski (1983) and Dinopoulos and Segerstrom (1999). In either case, the higher relative demand for skilled labour leads to a rise in the economy-wide skill premium, which in turn induces an increase in the relative supply of skilled labour. This supply response dampens the increase in relative factor demands, but (assuming that factor markets are stable) cannot eliminate it. So skill premia and skill intensities rise throughout the economy. All these predictions accord with the stylised facts presented in the introduction.

The details of this simple model are not to be taken too seriously.[18] But even as it stands, it suggests a number of lessons for the trade and wages debate which competitive models cannot capture. It clearly meets the Krugman critique: in the extreme case I considered, the threat of foreign competition is sufficient to lead incumbent firms to engage in strategic investment which raises the relative demand for skilled labour even though no imports actually occur. It also suggests that the effects of increases in North-North trade can be just as important as those of the quantitatively less significant North-South trade. Finally, it shows that the dichotomy between trade and technology as competing explanations for the change in relative skill demands is misplaced. For one thing, if t is interpreted as a tariff, then changes in trade barriers induce changes in technology in this model. For another, exogenous technical progress which took the neutral form of a reduction in the α_0 parameter in (18) would have almost exactly the same effects as a fall in t. (The only qualitative difference would arise from the disbursement of tariff revenue.) Hence, at least as far as

[18] Though the conclusions are robust to the assumptions about the number and behaviour of firms. I have shown in Neary (2002a) that the strategic effect is increasing in the number of incumbent domestic firms in Cournot competition. More surprisingly, it is also increasing in the number of firms if competition is Bertrand rather than Cournot, provided there is more than one home firm and products are differentiated but not too much so.

resource allocation is concerned, trade and technology shocks are observationally equivalent in the present model. This clearly poses headaches for empirical work. It also throws in a new light the findings from some empirical studies that the effect of trade on wages is greater in more concentrated industries. (See Borjas and Ramey (1995), Oliveira-Martins (1994) and Sachs and Shatz (1994).) But perhaps a broader lesson is that it is not trade as such but increased competition (actual or potential) which can lead firms to make defensive investments which raise their relative demand for skilled labour.

10. Conclusion

In this paper I have claimed that we need to think about the economy-wide and world-wide problems of globalisation using economy-wide and world-wide tools, by which I mean the tools of general equilibrium analysis. I have argued that some of these problems are poorly explained by general equilibrium models which assume a market structure that is competitive, whether perfect or monopolistic. More positively, I have suggested an approach which may break the log-jam that has held back progress in grafting oligopoly onto general equilibrium for so long. I have drawn on recent research to sketch a model which allows a consistent yet tractable treatment of oligopoly in general equilibrium, and have explored its implications for the effects of trade liberalisation on specialisation patterns, on cross-border merger waves, and on wage inequality.

Anti-globalisation protestors would no doubt be dismissive of a paper whose main theme could be summarised (unfairly, I hope!) by the proposal to replace constant-elasticity by linear demand functions in trade theory. However, they might be more sympathetic if I summarise the central message instead as a plea for incorporating real firms into general-equilibrium analysis. There are many dimensions to "real firms" of course. Increasing

returns and product differentiation have been successfully incorporated into general equilibrium in the voluminous literature on monopolistic competition and trade associated with Dixit and Norman (1980), Ethier (1982) and Helpman and Krugman (1985).[19] General-equilibrium implications of the internal organisation of firms have recently been explored by Grossman and Helpman (2002), Marin and Verdier (2002) and McLaren (2000). Finally, the new micro-econometrics of trade has uncovered some intriguing stylised facts - for example, surprisingly few firms engage in exporting, and those that do tend to be larger than average.[20] However, all these exciting developments have so far drawn little on models of industrial organisation, where incumbent firms engage in strategic multi-stage behaviour, and where entry of new firms is partly or fully restricted. I believe there is a huge pay-off to integrating this literature with general equilibrium theory. Moreover, the benefits may flow both ways, as I have suggested in my discussion of competition policy in general equilibrium and in my proposed resolution of the Cournot merger paradox. While the simple models I have presented here are only a first step, I hope I have persuaded at least some of you that the approach sketched in this paper is a promising route to this integration, which is badly needed if we are to increase our understanding of the real-world problems of globalisation.

[19] I discuss further the relationship between this literature and my approach here in Neary (2001, 2002b).

[20] See Bernard et al. (2000) and Melitz (2002).

Appendix to Section 9

When the home firm faces no competition, actual or potential, from the foreign firm, it chooses investment to minimise total costs, and produces the monopoly level of output. Its first-order conditions are:

$$k = \theta\omega y \qquad \text{and} \qquad 2by = A + \theta wk \tag{22}$$

where $A \equiv a - w\alpha_0$ is a measure of the cost competitiveness of the home firm. Solving for the monopoly levels of investment and output:

$$k_M = \frac{\eta}{2-\eta}\frac{A}{\theta w}, \qquad y_M = \frac{1}{2-\eta}\frac{A}{b} \tag{23}$$

where, as in Leahy and Neary (1997), $\eta \equiv (\theta w)^2/(br)$ can be interpreted as the relative efficiency of investment. The monopoly output level y_M is at point M in Figure 5.

When the home firm faces competition from the foreign firm, we need to calculate both boundary and interior equilibria of the two-firm game. In the second stage, the first-order conditions for output, and the implied output reaction functions, are:

$$\left.\begin{aligned} p - w\alpha &= by \\ p - t - w\alpha &= by^* \end{aligned}\right\} \quad \Rightarrow \quad \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}\begin{bmatrix} y \\ y^* \end{bmatrix} = \frac{1}{b}\begin{bmatrix} A + \theta wk \\ A^* + \theta wk^* \end{bmatrix} \tag{24}$$

where $A^* \equiv a - t - w\alpha_0$, the foreign firm's cost competitiveness. In the first stage of an interior equilibrium, each firm chooses its investment taking account of the strategic effect it will have on its rival's output in the second stage. Thus, the home firm's first-order condition is:

$$\frac{d\pi}{dk} = \frac{\partial\pi}{\partial k} + \frac{\partial\pi}{\partial y^*}\frac{dy^*}{dk} = 0 \tag{25}$$

Calculating these terms explicitly, and repeating for the foreign firm, the first-order conditions

for investment and the implied investment reaction functions (using the solution from (24) to eliminate outputs) are:

$$\left.\begin{array}{l} k = \mu\theta\omega y \\ k^* = \mu\theta\omega y^* \end{array}\right\} \quad \Rightarrow \quad \begin{bmatrix} 3-2\mu\eta & \mu\eta \\ \mu\eta & 3-2\mu\eta \end{bmatrix} \begin{bmatrix} k \\ k^* \end{bmatrix} = \frac{\mu\eta}{\theta w} \begin{bmatrix} 2A - A^* \\ 2A^* - A \end{bmatrix} \qquad \textbf{(26)}$$

The determinant of the coefficient matrix in (26) equals 3Δ, where Δ is defined as $(1-\mu\eta)(3-\mu\eta)$ and must be positive for stability.

Consider first the foreign firm's best response to the home firm's monopoly level of output. Substituting for k_M from (23) into the foreign firm's reaction function in (26), and setting k^* equal to zero yields:

$$\underline{A^*} = \frac{A}{2-\eta} \qquad \textbf{(27)}$$

So this is the threshold level of foreign competitiveness at which the foreign firm chooses not to invest when the home firm chooses the monopoly level of investment.

Next, consider an interior equilibrium. Solving (26) for the equilibrium levels of home and foreign investment:

$$k = \frac{\mu\eta}{\Delta} \frac{(2-\mu\eta)A - A^*}{\theta w}, \qquad k^* = \frac{\mu\eta}{\Delta} \frac{(2-\mu\eta)A^* - A}{\theta w} \qquad \textbf{(28)}$$

Hence, setting k^* to zero, the threshold level of A^* at which the foreign firm chooses not to invest (corresponding to point H in Figure 5) is:

$$\overline{A^*} = \frac{A}{2-\mu\eta} \qquad \textbf{(29)}$$

When the foreign firm has this level of competitiveness, the level of home investment is:

$$k\big|_{k^*=0} = \frac{\mu\eta}{2-\mu\eta}\,\frac{A}{\theta w} \qquad \textbf{(30)}$$

This is clearly greater than the unconstrained monopoly level given by (23).

Finally, for values of A^* between those given in (27) and (29), what is the home firm's best response to a zero level of investment by the foreign firm? Inspecting the matrix equation in (24) when k^* is zero, it is clear that the home firm's output and profits are higher when the foreign firm's output is zero. Hence the home firm maximises profits by choosing its investment not according to the first-order condition (25) but at a level that sets foreign output to zero. Using the solution from (24) for y^*, with k^* set to zero, the implied level of home investment is:

$$k\big|_{k^*=0} = \frac{2A^* - A}{\theta w} \qquad \text{where:} \qquad \frac{1}{2-\eta} < \frac{A}{A^*} < \frac{1}{2-\mu\eta} \qquad \textbf{(31)}$$

Thus the optimal level of home investment is increasing in A^*, and so *decreasing* in *t*, within the relevant range. Substituting $y^*=0$ and k from (31) into the home reaction function in (24), the home firm's output level in this range is A^*/b, which is the intercept of the foreign firm's reaction function on the *y* axis in Figure 5. This confirms that the level of home investment which is the best response to zero foreign investment in the first stage is just sufficient to set foreign output to zero in the second stage.

As for the "output reaction functions" in Figure 5, these represent the second-stage reaction functions from (24) with k and k^* eliminated using the first-order conditions in (26). Setting μ equal to *4/3* gives the loci *HH′*, *FF′* and *ff′*, while setting μ equal to one gives the locus *MH′*. Each of these functions depends only on the competitiveness parameter of the firm in question, whereas the investment reaction functions in (26) depend on both parameters. Hence it is easier to illustrate equilibrium in output than in investment space.

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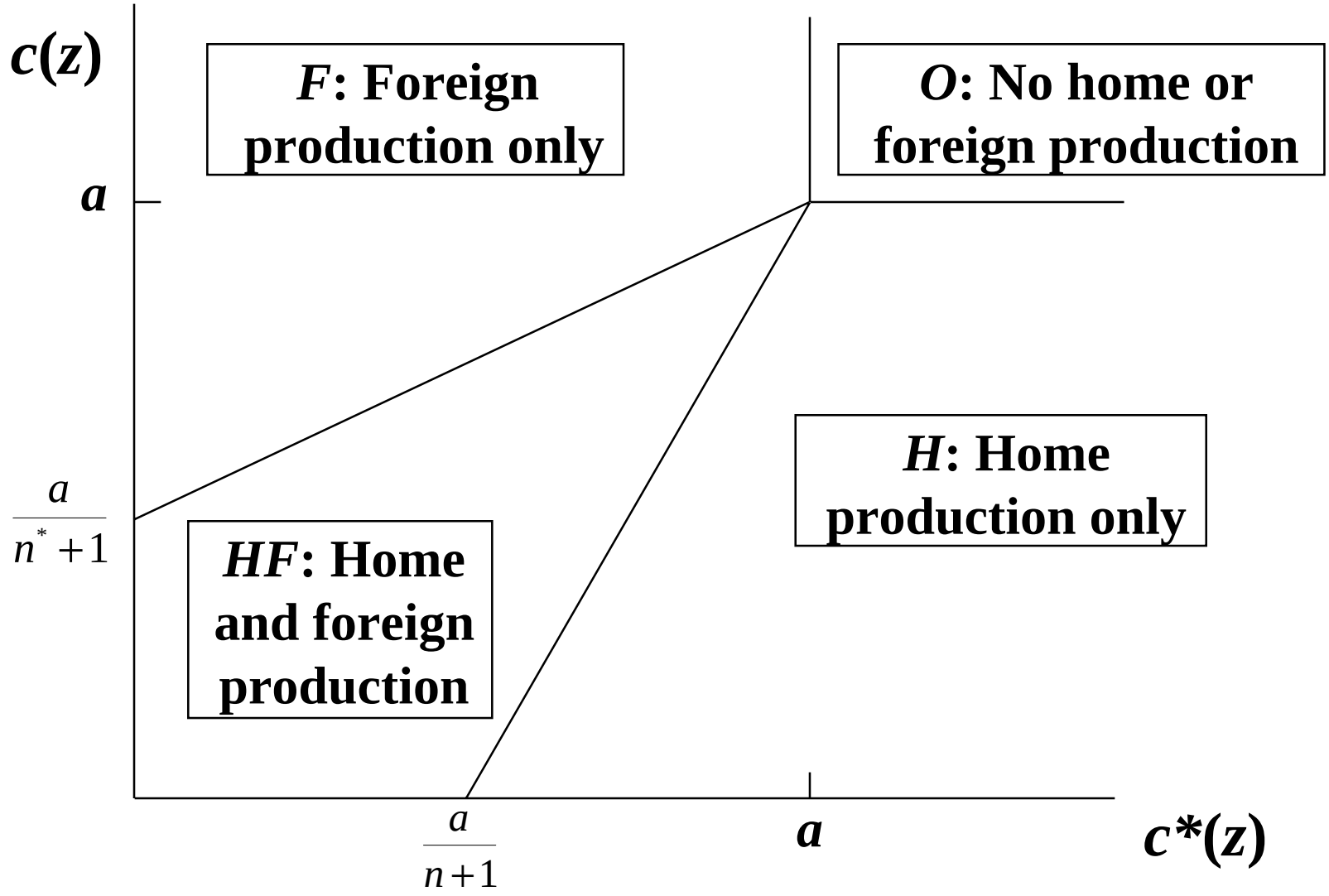

Figure 1: Equilibrium Production Patterns for Arbitrary Home and Foreign Costs

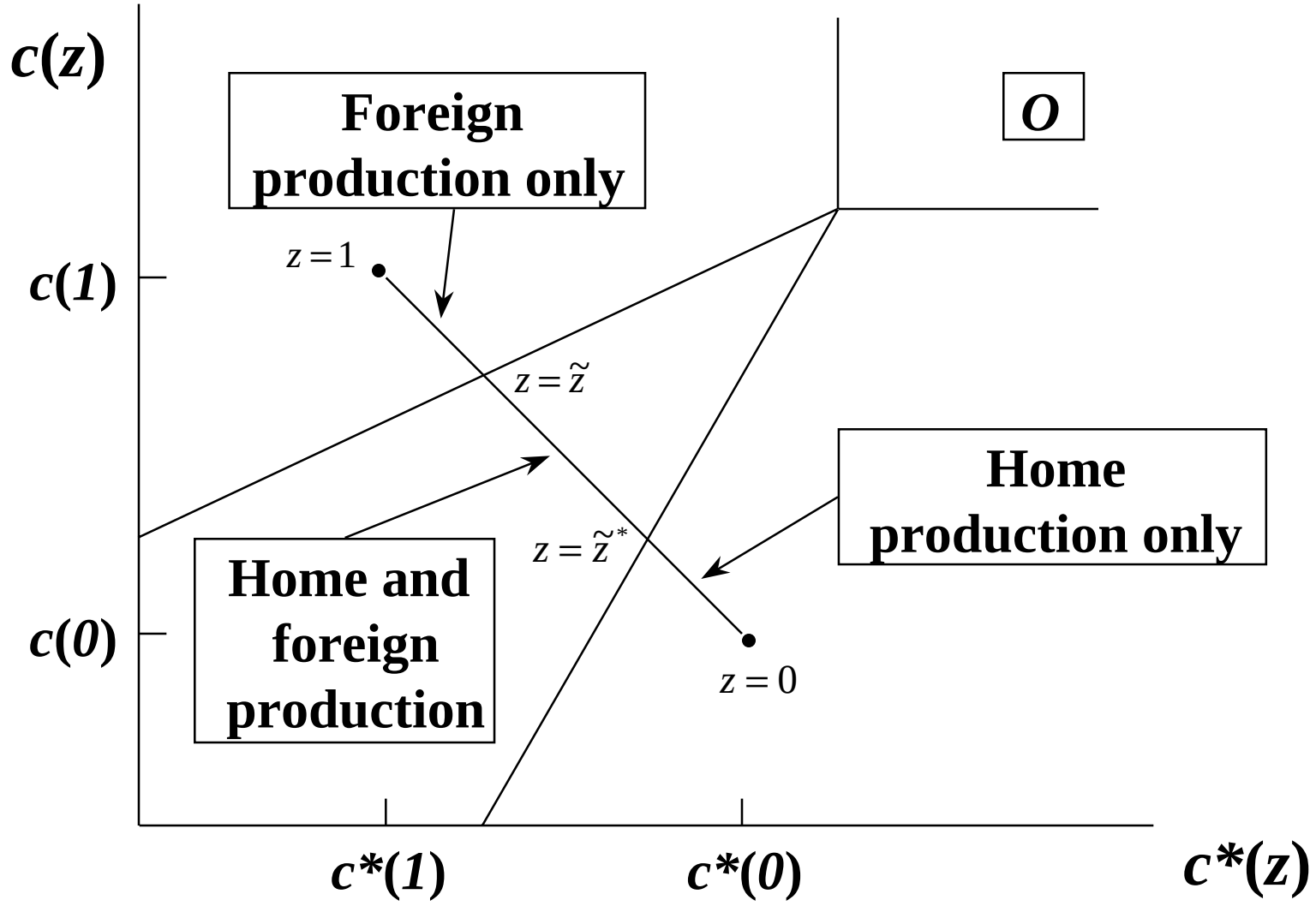

Figure 2: Equilibrium Production Patterns for a Given Cost Distribution

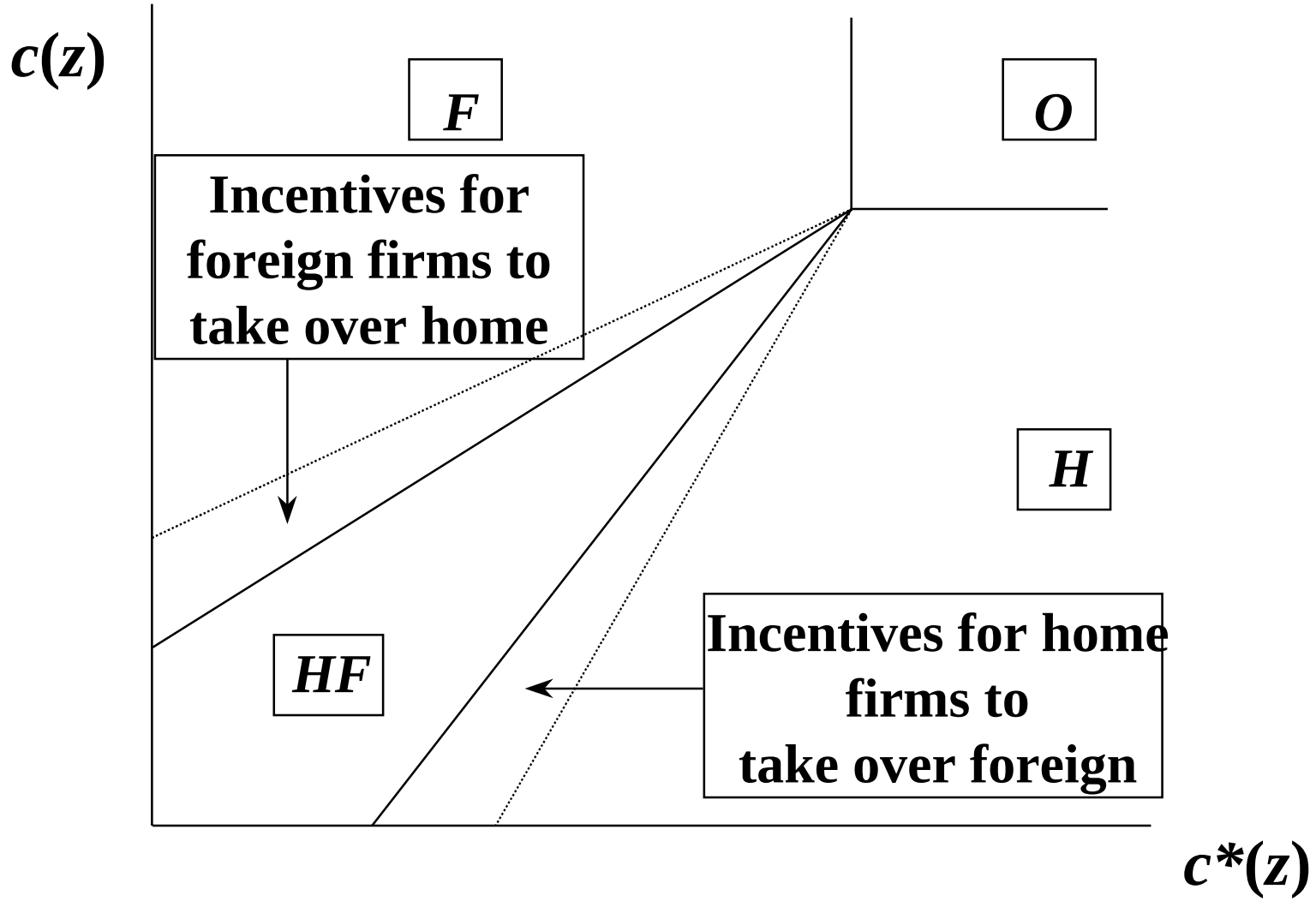

Figure 3: Takeover Incentives

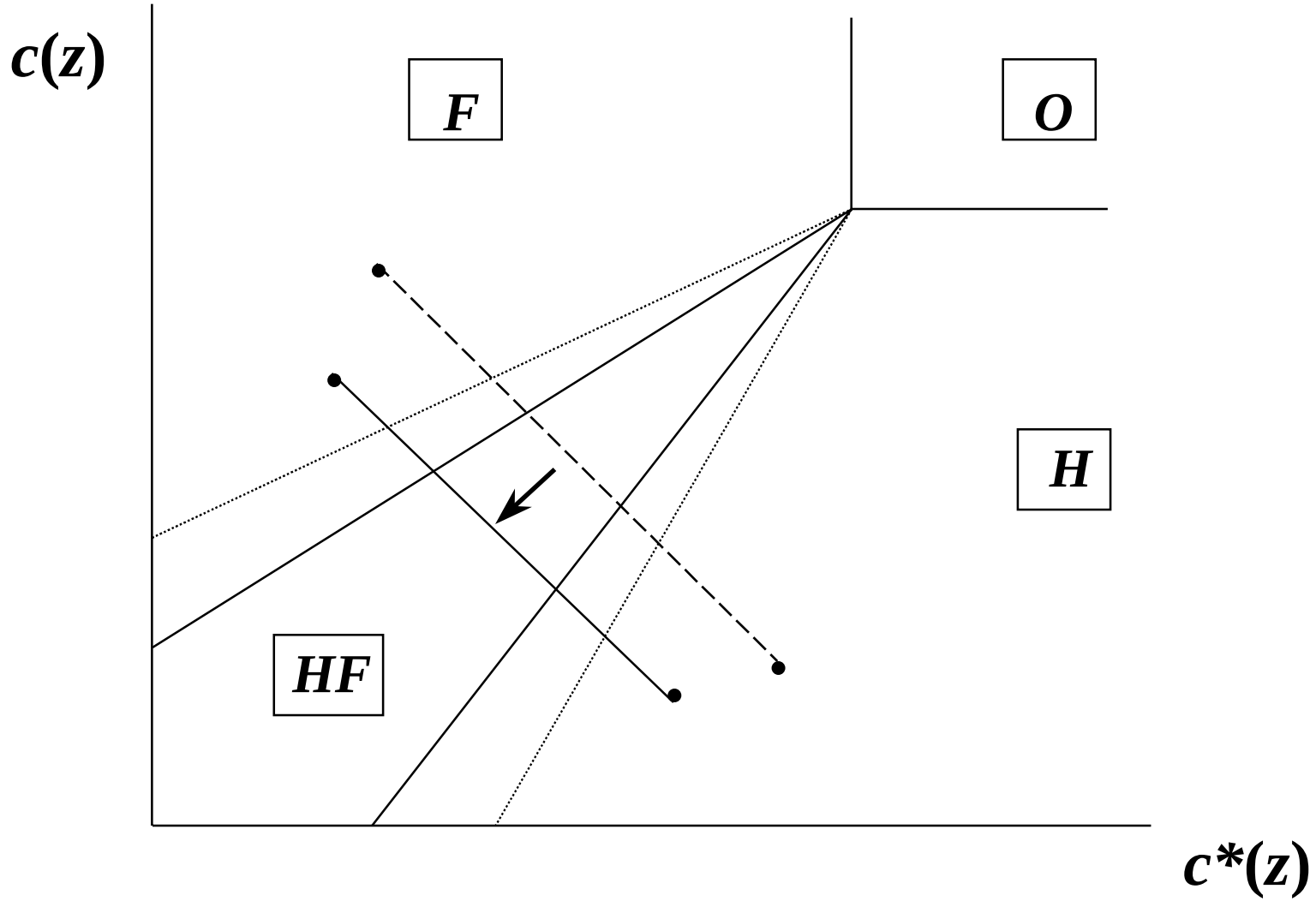

Figure 4: Wage Adjustments Dampen Cross-Border Merger Waves

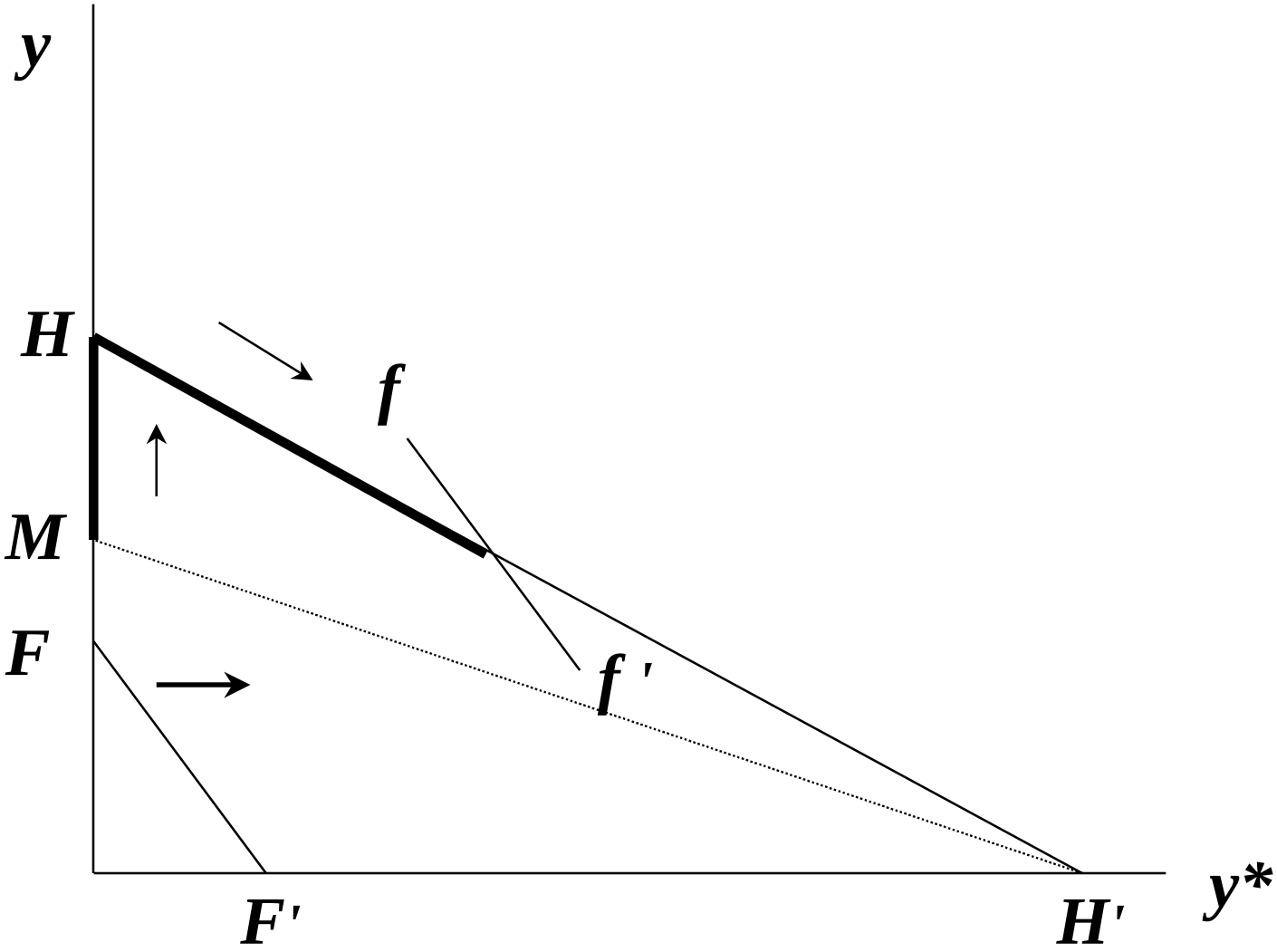

Figure 5: Equilibrium Sales in Home Market as Import Barriers Fall