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Monopolistic Competition and International Trade: Legacy and Perspectives

Ca' Foscari
Dorsoduro 3246
30123 Venezia

Relatore

Ch.mo Prof. Federico Etro

Correlatore

Ch.mo Prof. Danilo Cavapozzi

Laureando

Carlo Borgato
Matricola 845568

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Ma da dove viene la sapienza?

E il luogo dell'intelligenza dov'è?

È nascosta agli occhi di ogni vivente ed è ignota agli uccelli degli cielo.

L'abisso e la morte dicono: "Con gli orecchi ne udimmo la fama".

Dio solo ne conosce la via, Lui solo sa dove si trovi,

perché volge lo sguardo fino alle estremità della terra,

vede quanto è sotto la volta del cielo.

Quando diede al vento un peso e ordinò le acque dentro una misura,

quando impose una legge alla pioggia e una via al lampo dei tuoni,

allora la vide e la misurò, la comprese e la scrutò appieno

e disse all'uomo:

"Ecco, temere Dio, questo è sapienza

e schivare il male, questo è intelligenza".

Giobbe 28, 20-28

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Introduction:
The Origin and the Raise of the Monopolistic Competition Theory in Economics

Un economista deve impegnarsi a pensare il particolare in termini del generale,
e tenere assieme l'astratto e il concreto in un unico percorso di pensiero.
Deve studiare il presente alla luce del passato per gli scopi del futuro.

John Maynard Keynes

It is out of doubt that the research about the theory of monopolistic competition has given a great boost to the contemporary economics all-around research since its origin in 1933.

To correctly understand the relevance of that year and the spirit of that age, I want to quote a famous work of two of contemporary representative researchers, Philippe Aghion e Peter Howitt: in fact, the 1930's was a period of "creative destruction". The suffering due to the Great Depression was so strong that the economic community tried to find a new way to explain what was going on, establishing, in a certain sense, the current economics thought, but pursuing at the same time the aim of its "rehabilitation" to the eyes of the people in the period of apparent success of the Communism.

These purposes are certain true for the most famous economist of that period, of course the most influential of the last century and maybe, for someone, the most important - at least *ex aequo* with others like Adam Smith, David Ricardo and Alfred Marshall - in the economic-thought history, that is John Maynard Keynes.

For Keynes, the ultimate aim of economics was, and of course *is*, the attempt of finding the technical reasons for the successes or the failures of the market in reality. Just before the II World War, the aim was for sure the failure, meaning in particular the reasons of the collapsing of

consumptions and investments in the world economy and particularly in the United States; and the scope of that research of Keynes was the so-called macroeconomy, that is, broadly speaking, the sector of economics concerning the aggregate measures and their fluctuations.

But macroeconomics is just one aspect of the whole matter; the other one regards the micro-foundation of the productive sector of the economy; that is, the one that discusses the models of programming, production and interaction between firms and economic agents in general.

If the Great Depression had that impressive and destructive impact on the economic, "material" life of hundreds of million of people (forgetting for a moment all the political and social consequences of that crisis, consequences that naturally follow an economic disarray of that extent) mainly through the tremendous *phenomenon* of the massive unemployment, then the economic research went in the direction of "the nature and causes" of the under-production of the industrial system typical of those years and the economic reasons standing within that "peculiar" and tragic economic contingency.

The spirit of that period drove than to the pursuit of a new knowledge about the production-*criteria* and about the preferences and the behavior of consumers: and one of those who broke this new ground was Edward Chamberlin, the theoretical father of the monopolistic competition theory.

In the first chapter we will see a little bit deeply his innovative approach, that "blazed the trail" to the new field of economic research beyond the Marshallian perfect competition and monopoly, starting from the year 1933 with his *Theory of Monopolistic Competition*. The shining moment of Keynesian ideas during the 30's and the 40's pitched the set to the monopolistic competition theory, of course, but its time had to come yet; those years were naturally, maybe unconsciously, devoted almost completely to macroeconomics matters.

As we have said, we will see better Chamberlin's legacy with the march of the first chapter; but it is necessary to spend right here and right now a few words about the state of affairs in the moment in which monopolistic competition theory was born: the age dominated by the theory of perfect competition and by the monopoly.

The breakdown of the reigning theory, the perfect competition, is the absence of incentives and economic forces driving to the growth of the whole industry of the economic system, once it is ensured the zero-profits ending. Alfred Marshall - who is considered, thanks to his most famous work, the *Principles of Economics*, the father of the classical economic theory - was the first who tried to reconcile, in a convincing way, the theory of the market seen as aggregate of economic decisions and the theory of the firm seen as single agent's behavior: his attempt consisted into the introduction of internal diminishing returns for firms and external increasing returns for the whole industry- in a way that remembers the concept of externality.

After Chamberlin, however, research mainly rejected this field of studies, focusing into the "translation" and reception of Keynes' *magna opera*, the *General Theory of Employment, Interest and Money* published in 1936, a commitment which embodied the economic debate in those years; the economics of aggregates, together with a waving interest and respect for the monetary policy, dominated the post-war years.

It was necessary to wait for the year 1977 in order to re-discover the theory of monopolistic competition, thanks to Avinash Dixit and Joseph Stiglitz. Their work, *Monopolistic Competition and Optimum Product Diversity*, from a technical point of view will be discussed in the first chapter; here we must just say how, in that moment, times were ripe for the recognition of the value of the intuition of Chamberlin, and there were the adequate mathematical instruments necessary for building a complete, tractable model too (this is, in fact, the great value of Dixit and Stiglitz's contribution: they added to the original theory a formal "dress" that is - even if not so simple - tractable and effective).

The paper of Dixit and Stiglitz is deservedly recognized as one of the most important work in economics since it has easily made feasible the implementation of a such fundamental market-structure that monopolistic competition of course is.

The last step for the success of the monopolistic competition theory was due to the modern event of globalization.

This last passage was the natural "update" of this successful theory and its obvious application to the modern rising matter of our society. Great economics minds like Stiglitz, Krugman, Acemoglu and many others had applied to the scope of the globalization among nations, that is, to the close interactions and multiple links among countries that emerged in whole world particularly in the last forty years, and how these connections were and are still influencing countries' development and growth, putting for a moment aside ethical and social consequences of this *phenomenon* and focusing just on the mere technical, economical questions.

More recently, a new boost to the international trade theory has been given by Marc Melitz (in 2003 with his great work *The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity*) together with many other researchers in these last years, whose contributions will be explained in the first chapter.

If monopolistic competition theory is a sort of way in between the "democratic" nature of the perfect competition mixed with the concentrated power of the monopoly, and this theory is still actually a winning-idea in economics, it may be true what Orazio - and Aristotele stated in a similar way before him - has stated, that is: *in medio stat virtus*.

All these researches and studies - which to the most part of the people may seem to have an end in themselves with all their strange, sometimes unrealistic hypotheses that look like abstractions to the real problems of our societies - are instead a part of the continuous process of human knowledge development; I'd like to remember the scope, the role and the aim- but also the genesis - of the second great work of the carrier of Keynes, that is, *The Economic Consequences of the Peace*, written as direct and immediate answer to the repugnant decisions taken in the Peace Conference of Paris in 1919, Keynes present.

That pamphlet was an honest and deep analysis of the social and political thought of those years (and furthermore it has been written in a few weeks, that is a proof of the disdain of Keynes for that unfair peace; indeed Keynes resigned from his role of economic observer and counselor of the United Kingdom at the Conference), a sort of *manifesto* against the winning military and political establishment and the consequences of its "peaceful" decisions that of

course denounced the incredible insanity of those acts of revenge and it is still an incredible and precious economic and historical document. The *General Theory* itself has been correctly celebrated, also in my opinion, as the other *manifesto* of the orthodox capitalistic thought - even if it broke some conventions of the classical theory and although all its limits - because it symbolized the efforts made in order to explain what was going on in the economic system during the Great Depression, trying to find a "new" way to understand and to save the capitalistic model in the years of the (illusory) success of the communism.

And all this without forgetting that the great aim of Keynes as condition for the success of a society was the full-employment state.

Monopolistic competition theory was born and achieved its success in those same years in which the new models of international trade have been applied, with the purpose of explaining the reasons of the inter-nations commerce that is so much influencing and changing our societies.

This work tries to be a synthetic but exhaustive literature review about the evolution of the model of monopolistic competition - from the original intuition due by Chamberlin in 1933 to the more recent theoretical and empirical contributions, getting through the fundamental papers written by Dixit and Stiglitz in 1979, by Paul Krugman in 1980 and 1981 and by Marc Melitz in 2003 - and the key-importance it has acquired with the march of the time for the development of the new international trade theory, theory currently based on the concepts of economies of scale and on the so-called "love for variety" as reasons, for producers and consumers respectively, for the establishment of trade relations among nations.

But we will also give a quite deep look to one recent paper, *Trade Liberalisation with Heterogeneous Firms*, published by Baldwin and Forslid in 2010, where these reasons are confirmed but also deliver peculiar results that are in contrast with the standard "pro-variety" effect that emerges from the conventional trade theory essentially based on the works of Krugman of 1979-80.

In the last chapter we will see some little but interesting extensions to the Baldwin-Forslid model concerning the trade pattern and the trade balance in that context as well as some considerations about the peculiarities that differentiate that model from the standard trade theory, also regarding trade margins.

It finally will be clear, then, how the model of monopolistic competition has not yet depleted all its possibilities of contributing, after so many years, to the modern economic research, even in the crucial scope that international trade is for our society and for the challenges that we must face nowadays and in the forthcoming future.

Chapter I
The Monopolistic Competition Theory in the International Trade Context

1933 - The Origin: Edward Hastings Chamberlin (and Joan Robinson)

Edward Hastings Chamberlin, pioneer and conceptual father of the monopolistic competition, was born in La Conner, Washington, in 1899, he published his work concerning the new market-structure he called monopolistic competition in 1933 - at the age of 34 and just six years after obtaining his Ph.D. at Harvard -, and since that year much of his academic life was spent against some misinterpretations of that fundamental work and then on differentiating it from Joan Robinson's one, his competitor in this new field of economics. Robinson, an English economist of almost the same age of Chamberlin, had indeed the same intuition of Chamberlin nearly in the same period about the possibility of a sort of "hybrid" among perfect competition and monopoly; the possibility that different researchers have the same intuition at the same time is a fact that may happen frequently in economics since some ideas circulate in the academic environment because of the transitory evolution of the real economy, which inevitably influences research and scientific speculation.

Anyway, Chamberlin died in Cambridge in 1967 before the clear and neat acknowledgement of the value of his intuition; but this should not be surprising, since it is the destiny of many great works and ideas, and also of their authors.

Nevertheless, this is not the place for discussing also the peculiarities of Robinson's version - better, her *interpretation* - of the monopolistic competition theory with respect Chamberlin's one; but, in order to understand the real value of the intuitions of Chamberlin, it is necessary to briefly discover some of the troubles and the critics his work had to deal with, one for all the dominance of the legacy of perfect competition and monopoly in the economic theory in the years in which

monopolistic competition theory appeared.

So, monopolistic competition was born in the period of "conceptual monopoly" of monopoly and perfect competition, with their contrasting views about social welfare. Also the well known hybrid market forms (the oligopolies *à la* Cournot and *à la* Bertrand) were already present in those years, but not so much exploited: as Alfred Marshall correctly pointed out, Cournotian and Bertrandian oligopolies depend from too many special assumptions to be feasible and tractable for a lot of real contexts.[1]

The compelling problem of the microeconomic theory, in those years, was to reconcile itself - fighting against its own legacy - with the new clear micro-evidences about firms' increasing returns, mainly, that are incompatible with perfect competition, and the emerging of the pure macro-theory and its consequences on industrial economics as an answer to the big troubles and questions put by the Great Depression.

Marshall himself tried to solve the matter introducing diminishing returns for the individual firms in a context of economies of scale of the whole industry, in a sort of great scenario of "positive industrial externality", obtaining in this way justifications for the industry-growth and the international trade - in a way that in some aspects anticipated the intuition of Krugman in 1979 - but not touching the real essence of the economies of scale and then of the monopolistic competition theory: his analysis included the concept of both internal and external economies of scale, in which bigger firms has an advantage on smaller ones and then the conditions for reaching a monopoly are again recreated; moreover, the same Marshall thought about the supply curve in the long-run as a straight line, leaving then undetermined the level of production.

Piero Sraffa[2] underlined these weaknesses of the Marshallian theory in his work *The Law of Returns Under Competitive Conditions*, highlighting how for Marshall firms were operating in a sort "special market", because in reality products often are not perfect substitutes and consumers may make distinctions between similar products that can be, *de facto*, substitutes.

Sraffa's points were then supported in 1933 by Joan Robinson (*The Economics of Imperfect Competition*)[3] and Edward Chamberlin (*The Theory of Monopolistic Competition*);[4] the father of the theory is considered the latter one thanks to his concrete and complete departing from monopoly and perfect competition theories and to the better analytical - even if not yet complete and tractable - exposition, based on the well-known four basic assumptions:

- The "**Cournot-Nash**" **assumption**: each firm takes the behavior of the group of its

1 Peter Schumpeter in 1954 in his *History of Economic Analysis* stated that "the large majority of cases that occur in practice are nothing but mixture" of perfect competition and monopoly.

2 Sraffa, P., *The Law of Returns Under Competitive Conditions*, The Economic Journal, December 1926, Vol. 36 No. 144.

3 Robinson, J., *The Economics of Imperfect Competition*, Macmillan, London 1933.

4 Chamberlin, E. H., *The Theory of Monopolistic Competition*, Harvard University Press, Cambridge (MA) 1933.

competitors as given - and then cannot influence other firms' behaviors - because **the number of total firms operating in the economy is *sufficiently* large** (this "sufficiently" big number of plants will be crucial in the technical exposition of Dixit and Stiglitz in 1977 and then of Krugman in 1979);

- **Free entry and exit** are allowed for firms in the economy;
- The group of competitors is well-defined and, compared to the whole economy, relatively small;
- **Each firm products a different variety of a good** among all the available products, that is in some kind "unique" and differentiated with respect competitors' products.

The latter assumption embodies the "monopolistic" side of the model; the first two are instead the essence of the "competitive" aspect of this theory.[5]

This is what Chamberlin exposed for the first time in order to give an answer to the matter Sraffa had pointed out: the possibility to reach the equilibrium in a context of monopolistic competition, in which there are decreasing average costs for firms. But to understand the real, full and analytical meaning of that *sufficiently large* number of firms that Chamberlin assumed in his formulation of the theory, we need to wait until the formal exposition of Dixit and Stiglitz in 1977.

We must remember that in those years the most part of the analytical instruments necessary to develop a complete theory as researchers can do nowadays were not yet available; in this sense, the contribution of Chamberlin acquires more importance, and the same must be said for the key work of Dixit and Stiglitz in 1977, who were able to mathematically reproduce in a feasible and tractable model the original intuition of Chamberlin.

In **Figure 1** we can see the graphic representation of the whole static theory of Chamberlin. There are two different demand curves: ***D*** and ***d***. The former, *D*, that is the steeper one, is the demand curve facing each firm if all firms would set the same price; the latter one, *d*, is the demand curve that an individual monopolistic-competitive firm faces, when all the other firms don't change their price, also called "perceived" demand curve by Archibald,[6] and ~~it's~~ it is the curve of our interest. As usual, *MR*, *MC*, *AC*, *P* and *X* are respectively Marginal Revenue (associated to *d*) and Costs, Average Cost, Price (of the differentiated product given by the monopolistic competition) and output. The Chamberlinian *equilibrium* is located in the point ***E*** (P^m with X^m), where individual firm attains the *optimum* result because there are no other profits to exploit and entry/exit of other firms is not possible. In fact, the individual firm maximizes its profits given *d*, and it would find its optimum equating *MR* with *MC* - clearly, following classical theory (point *A*); but the "tangency condition" of Chamberlinian memory tells us to reach the point where *d* is tangent to *AC*, making in the long-run profits equal to zero: no firm-entry or -

5 Chamberlin, 1933 (see note 4).

6 Archibald, C. G., *Monopolistic Competition*, in Eatwell, J., Milgate, M., and Newman, P., eds., *The New Palgrave: A Dictionary of Economics*, Macmillan, London 1987.

exit, no profits or losses in *E*. An important idea, that is useful to remember, is the intuition of the chance of entering and exiting for firms.

If firms would operate facing *d′*, taking *P′* as price, producing then *X′* and reaching *B* as "*equilibrium*", they had positive returns (equal to the **gray area**): but each monopolistically competitive firm has an incentive to move along *d′* trying to catch as most consumers as possible from other competitors, still making profits (or at least no losses).

For Chamberlin, the solution to this static process is that *d′* shifts down to reach *d*, reaching then the equilibrium in *E*.

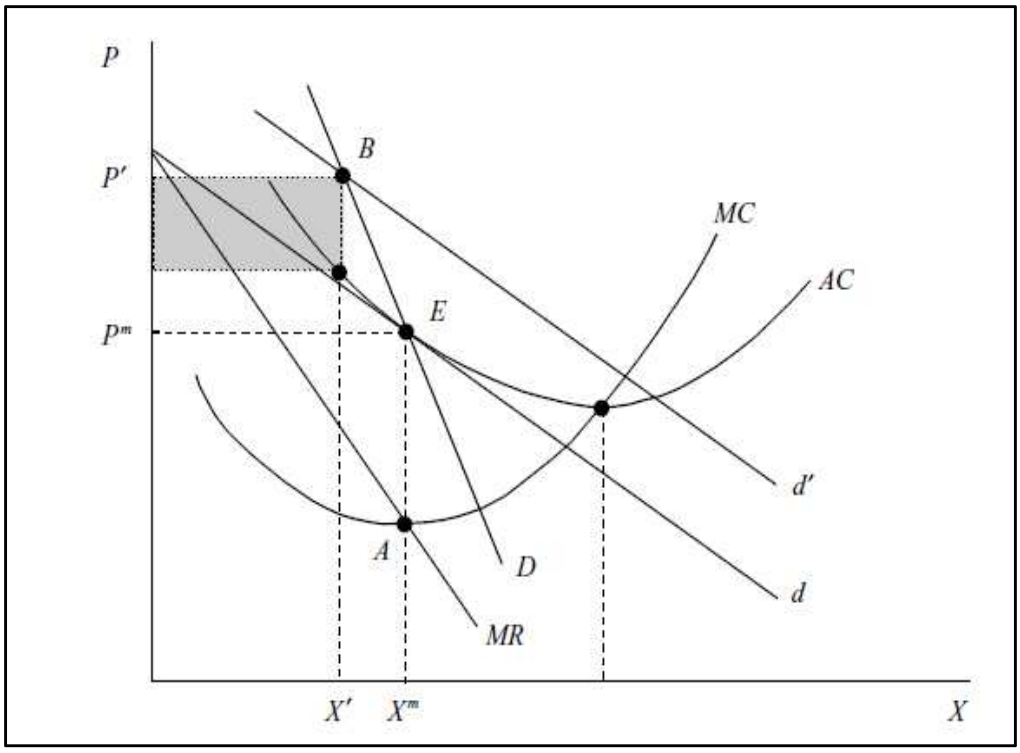

Figure 1 - Chamberlin's Static Model of Monopolistic Competition (1933)[7]

7 This graph is the reproduction of the one proposed by Brakman and Heijdra in the Introduction of their book *The Monopolistic Competition Revolution in Retrospect*, Cambridge University Press, 2004.

Clearly there is a spread between the two main points that the *AC* curve defines, that are, its point of tangency *E* with the demand curves and its point of minimum: it is really important to notice that they do not coincide! This fact introduces - and has introduced in those early years - the discussion whether this equilibrium would be or not, at the end of the day, welfare reducing, leaving chances of economies of scale (or, that is the same, increasing returns) unexploited.

In the following paragraphs we are going to see how this topic - that seems for sure implying a "waste" of resources - is instead the analytical key to understand the more important, crucial intuition of "love for variety" and the consumer's preference for product diversification.

Dixit and Stiglitz in 1977 will deal with this unsolved - up to that year - matter, obtaining peculiar results that are quite in contrast with the first negative critique of the Chamberlinian model about welfare and the unexploited "excess of capacity".

This is a fundamental point of our analysis, because Chamberlin thought that the chance of variety in products' availability is a key factor in determining the welfare of a society; in fact, as for Keynes social implications were basic aspects of the economic science and so the ultimate scope of his *General Theory*, for Chamberlin welfare considerations were fundamental too, and they necessarily went through the concept of variety in goods - that should be seen as the positive result obtained sacrificing the best long-run positioning in the *AC* curve for a worse one.

The difference between Robinson's and Chamberlin's interpretation of their same work is that the latter saw virtually all markets as having elements of monopoly and competition, but did not see this condition as a market failure. Robinson, on the contrary, tended to see every departure from perfect competition as a concession given to the imperfect real world opposing the ideal state of the perfect competition: the fact that nowadays the name of Chamberlin is remembered so much more than the one of Joan Robinson comes in a relevant part from this conception, from many aspects limited, of the modern market structures.

All told, it must not be surprising that the monopolistic competition theory had to face many opponents in the first decades of its life: Kaldor (1934, 1935), Hicks (1939), Stigler (1952), Friedman (1953) and Archibald (1961, 1987[8]) all criticized this new theory, who because of its framework, judged mathematically unworkable (Hicks[9]), who for its result too much "similar" and then not innovative compared to the perfect competition (Stigler and Kaldor in particular), who for its strong assumptions (Archibald 1987, about the concept of "group") and finally who because of methodological and conceptual reasons (Archibald and more heavily Stigler, who stated how Chamberlin had failed in the attempt to describe in a mathematical way his vision of the economic world against the success, instead, of Marshall who, with all the limits of his theories, was adequate for his scope).[10]

For many critics, maybe the most difficult aspect to accept in the monopolistic competition was the fact that firms operate in the long-run with that excess of capacity that they could only heavily criticize, but bring at the same time results similar to perfect competition and also

8 See Archibald, C. G., *Chamberlin Versus Chicago*, Review of Economics and Statistics, 1961.

9 Hicks, J. R., *Value and Capital*, Oxford University Press, Oxford 1939.

10 Stigler, G. J., and Boulding, K. E., *Reading in Price Theory*, Richard D. Irwin, Inc., London 1952.

including (actually, fostering) an increase in variety of goods in free-entry: this is the famous critic of Kaldor.[11]

With free entry, Kaldor reasoned, competitive firms could enter in the market not only with substitute goods but also with *identical* products; probably Kaldor, like most economists of his age, did not break himself away from the Marshallian way of reasoning that saw everything traded as homogeneous commodities without the characteristics of brand loyalty, quality difference, heterogeneous consumers' perceptions and differentiated services that are internalized in a monopolistically competitive market. In 1934 and 1935 Kaldor moved several critics to Chamberlin - together with others referred to Robinson and Marshall - whose main points were four, to which Chamberlin answered with two papers in 1937 and 1938:[12]

- Products available in the market are differentiated in the sense that they are not always substitutes. But the assumption of substitutability, that will be so well embodied by the CES utility-function, is clearly a useful hypothesis that does not alter the technical analysis and the final economic meaning of the theory;

- Consumers do not distribute their consumption among the whole basket of purchasable goods, and firms have no exact knowledge of the demand curve itself and of their competitors but they can only "image" a demand curve, precisely because consumers do not exploit the entire bunch of goods. Once again, we are in the field of the useful and simplifying assumptions that are not able to alter the ultimate value of the model;

- Monopolies (particularly, institutional ones) are actually present in the real market and alter the assumption of uniformity and symmetry among firms;

- Excess-capacity is present and (obviously) not exploited in the Chamberlinian model. This is surely the most relevant possible critique at that time, but we will discuss again this point seeing how the Dixit-Stiglitz model will mathematically confute this attack.

In contrast, Chamberlin's perception was more in the mode of modern theory, where are particular *varieties* of goods that yield the total utility; the distinction between commodities and goods is the basis for the approach of Kevin Lancaster in *Consumer Demand: A New Approach*

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11 Kaldor, N., *Market Imperfection and Excess Capacity*, in Kaldor, N., *Essays on Value and Distribution* (1960), 1935, and *A Classificatory Note on the Determinateness of Equilibrium*, The Review of Economic Studies, 1934. See also Kimura, Y., *Kaldor on the Equilibrium of the Firm: 1934-1938*, Hitotsubashi University, for a resume of Kaldor's analysis on Marshall, Robinson and Chamberlin's theories of imperfect competition. An other relevant, critic contribution of Kaldor is the collection of writings *Essays On Value and Distribution*, Duckworth, London 1960, including the two essays *The Equilibrium of the Firm* (1934) and the aforementioned *Market Imperfection and Excess Capacity*.

12 Chamberlin, E., *Monopolistic or Imperfect Competition*, 1937, and *Reply to Kaldor*, 1938, both published in the Quarterly Journal of Economics.

(1971) and in *Socially Optimal Product Differentiation* with regard to consumer's behavior (and one can see a continuation of this approach in the famous work by Gary Becker in 1965 with regard to the allocation of time).

The excess capacity discussion, reached easily via tangency as in Figure 1, can be disputed on simpler grounds than the analytical one given by Dixit and Stiglitz in 1977 (as we will discover in the following paragraph): in the real world, empirically measured costs seem to have a wide range of relatively flat marginal and total cost curves, unlike the typical textbook depictions; as a consequence, the tangency-induced excess capacity, even if not irrelevant, is of little practical significance, as other possibilities about cost curves trends, that are just simplifications of reality. Further, as Rothbard (1993)[13] has pointed out, the tangency solution rests on the assumption of continuous demand and cost functions that are convenient for mathematical derivation, even if sometimes in contrast with the real world that can be instead also characterized by discrete functions. Harrod (1952),[14] anticipating rational expectations argument, pointed out the irrationality assumed in alleging that a firm manager, knowing that market conditions will force him to produce one level of output as dictated by the tangency solution, would then choose to build a plant of a size that is optimal for a higher level of production.

More recent criticisms of the excess capacity conclusion are more complex. The markets literature spawned by William Baumol and colleagues essentially concludes that free entry and exit are sufficient to negate excess capacity in less that perfectly competitive firms. Many critics have than pointed out that there is an inconsistency between the assumption of heterogeneous products and uniform cost functions; but I think this is, instead, a realistic assumption.

The methodological positivist approach of Milton Friedman, moreover, takes as one of its central propositions that a theory must explain a wide range of phenomena, and this necessitates the establishment of unrealistic assumptions. But it is not only the realism, or the lack of it, in a theory's assumptions, the mean a theory should be judged by, but rather by the accuracy of its explanations or predictions (following a pure positivistic approach); for this reason, Friedman and others economists have deemed Chamberlin's model to be a failure, adding nothing to what is understood by reference to the reference-models of perfect competition and monopoly.

John Maurice Clark (1940) stated instead that for many, if not most industries, potential rivalry would be sufficient to reduce the difference between the efficiency of monopolistic vs. perfect competition (including the matter of capacity use) to such a small matter of degree that public policy would not spot the difference; however, Clark was in agreement with Chamberlin that the model of perfect competition, besides having little connection with the real world, should not be the norm that forms the basis for public policy - particularly for antitrust policy.[15]

The first solid support in recent years, after those ones of debating after the editing of the theory, to Chamberlin and Robinson (but also to Sraffa) came from Paul Samuelson, who saw in their theory, instead of the previous underlined weak points, a good way to approximate industrial reality in a model, given the failure of perfect competition in reaching quantitative and

13 Rothbard, M., *Man, Economy and State with Power and Market*, Ludwig von Mises Institute, 2009.

14 Harrod. R., *Economic Essays*, Macmillan, London1952.

15 Clark, J. M., *Toward a Concept of Workable Competition*, American Economic Review, 1940.

qualitative predictions coherent with reality and adaptability to the arising international trade evidences.[16]

Peter Schumpeter (1942) always regarded perfect competition as an exceedingly imperfect ideal that would be antithetical to the entire process of innovation and economic progress; Chamberlin considered his own perspective completely compatible with that of Schumpeter, and Alex Hunter was one their contemporary who also saw them as compatible (1955).[17]

Acceptance of Chamberlin's theory, already in his years, would have destroyed the neat conception of a market or industry embedded in economics by Marshall; moreover, it was acknowledged how monopolistic competition was incompatible with general equilibrium theory. For many researchers, this inconsistency substantially limited the value of Chamberlin's contribution; for others, instead, this inconsistency was merely a technical fact, and it simply limited the scope of applicability of the theory to partial equilibrium problems (Triffin).[18]

Chamberlin described human beings as by their nature diverse,[19] and this fact for itself should lead to entrepreneurs appealing to these diverse demands with heterogeneous products. And if diversity is what consumers want, and consumers' wants are the basis of welfare theory, then a correct measure of welfare would incorporate this truth into construction of the welfare ideal. I think this is a conceptual key-point to understand the position and the approach of Chamberlin compared to his conservative colleagues in the first years of debate around the monopolistic competition.

Chamberlin himself argued that, while it is true that in monopolistic competition firms do not operate on the lower point of their average cost curve, and in this sense they might be inefficient (as it is by definition in welfare economics - but we will see how this is not completely true, because monopolistically competitive firms operate in their second-best as Dixit and Stiglitz will show in 1977), product differentiation cannot be said to reduce economic welfare unless it can be shown that the loss of efficiency is somehow greater than the gain in consumer utility due to increased variety: with not so much humility but maybe with reason - that is much more important - he argued that *the inability of welfare economics to incorporate this and other aspects of monopolistic competition indicates the inadequacy of modern welfare economics, not of the theory of monopolistic competition*.

But if his model of monopolistic competition was incompatible with a general equilibrium and the welfare economics, not only was it because of the limitations and inadequacies of welfare economics, but also because of the false notion of the existence of a Marshallian industry demand curve that still hold in those years: it persisted because it told a neat and formal story that fitted so well into the general equilibrium construct that economists admired, irrespective of the

16 Samuelson, *The Monopolistic Competition Revolution*, in Kuenne, R., *Monopolistic Competition Theory: Studies in Impact*, John Wiley & Sons, New York 1967.

17 Hunter, A., *Product Differentiation and Welfare Economics*, Quarterly Journal of Economics, 1995.

18 Triffin, R., *Monopolistic Competition and General Equilibrium Theory*, Harvard University Press, Cambridge (MA) 1940.

19 Chamberlin, E. H., *The Theory of Monopolistic Competition: A Re-Orientation of the Theory Value*, Harvard University Press, Cambridge (MA) 1950.

fact that it does not exist in a real world of actual product differentiation.

1977 - Dixit&Stiglitz and their Legacy

After about thirty-five years of almost silence, in 1977 two researchers of economics, Avinash Dixit and Joseph Stiglitz, tried to re-develop the intuition of Chamberlin starting from his static early version and reproducing his model with the new techniques and mathematical instruments meanwhile become available.[20]

Michael Spence had already given a new boost to the research about monopolistic competition during the 1976: his two articles both of 1976[21] had been important for the work of Dixit and Stiglitz (hereafter, also **D-S**, more briefly), as they highlighted at the beginning of their article. Spence underlined how product differentiation was still a complex but crucial field of studying in order to understand the correct welfare effects of a monopolistic competition environment, also because of the nature of the cost-function with fixed costs, that may generate (generally) multiple *equilibria* and different elasticities of prices and substitutions across goods, that can generate too many varieties, or too few (relatively to the *optimum*). Spence anticipated the debates about products differentiation and the role of the elasticity in determining the number of varieties, the profits for firms and the total net welfare.[22]

In this paragraph we are going to see the main assumptions and results of the D-S work, in order to have a good feedback about this key work about monopolistic competition.[23]

Social optimum and the trade-off between *maximum* production and goods diversification are once again the core also for the paper of Dixit and Stiglitz. Authors recognize three main reasons for this matter: distributive-social reasons, external agents through externalities and scale economies; this latter reason is the aim of their work.

D-S debated essentially three cases of study, involving different utility-specifications; the one of interest for us is the well-known one in which a generalized utility-function has the property of

20 An exposition of the algebra and of the main concepts of D-S is offered by J. Dingel with his *The Basic of Dixit-Stiglitz Lite* (June 2009). A technical introduction is also given by Baldwin, Forslid, Martin, Ottaviano and Robert-Nicoud in their *Economic Geography and Public Policy*, Princeton University Press, 2005.

21 Spence, M., *Product Selection, Fixed Costs and Monopolistic Competition* in Review of Economic Studies, June 1976, and *Product Differentiation and Welfare* for the American Economic Association, May 1976.

22 See Appendix A for a brief reference of Spence's work extracted by his *Product Differentiation and Welfare* (see previous note).

23 See Foltyn, R., *Results from the Dixit/Stiglitz Monopolistic Competition Model*, *mimeo*, 2004, for more detailed computation and derivations of the D-S model.

a *constant elasticity of substitution* (CES). Their work presents initially an introduction about the problem of the diversification against the massive, optimal production of the economy: authors began their exposition stating how, clearly, in a very intuitive way, in a scale-economy environment resources can be saved, reaching higher levels of production, exploiting the trade-off varieties/output in favor of the latter one, but with a loss of welfare for consumers (and the protection of the consumers' welfare is one of the main aim of economics).

The models that had previously tried to model product-diversification theories (by Lancaster, or the Hotelling "spatial model", or the optimal portfolio selection through the mean-variance criterion refined by Markovitz) involved too many technical special hypotheses and transport/transaction costs that are "hard to interpret in general terms", using the words of D-S, who then tried to develop their new model with a "direct" approach, on the basis that the convex nature of indifference curves (in their case, surfaces) actually has by itself the feature of the variability, too.

The object of their first analysis is the case where potential commodities in a sector (industry) are substitutes among them but poor alternatives for the other sectors' goods.

The main starting assumptions of the D-S model are:

- The generalized utility-function *U* (a representative consumer's utility function or a social preference function), is expressed as:

$$\boldsymbol{u} = \boldsymbol{U}\left(\boldsymbol{x_0}, \boldsymbol{V}\left(\boldsymbol{x_1}, \boldsymbol{x_2} \ldots\right)\right)$$

  that is (weakly) separable and convex, and aggregates all the output of the economy in one single *numeraire*-good labeled with *0*;[24] the economy has an initial endowment of it equals to 1;

- Than, in the CES case, the generalized utility-function $\boldsymbol{u}$ becomes:

$$\boldsymbol{u} = \boldsymbol{U}\left(\boldsymbol{x_0}, \left\{\sum_{\boldsymbol{i}} \boldsymbol{x_i^{\rho}}\right\}^{1/\rho}\right)$$

  - it is assumed to be (quasi) concave, homothetic in its argument and separable;
  - there are *n*+1 goods and a representative consumer who chooses a consumption-program such that maximizes the utility-function;
  - $\boldsymbol{\rho}$ is the substitution parameter for goods, bounded between (0,1), so **goods**

24 With weakly-separable utility-function, the MRS of two goods belonging to a group is independent from the quantities of goods in other subsets of that group (see Gravelle and Rees, 2004).

are neither perfect complements nor perfect substitutes (and if $\rho < 0$, goods are complements);

- ❖ The budget-constraint of the consumer is:

$$\boldsymbol{I} = \boldsymbol{x_0} + \sum_{i=1}^{n} \boldsymbol{p_i x_i}$$

where $\boldsymbol{I}$ is the income in terms of the *numeraire* good *0*;

- ❖ There is a *sufficiently large* (sufficiently for what, we are going to see in a while) number n of firms.

Dixit and Stiglitz could adopt a two-stage maximization process thanks to the aforementioned features of the utility-function, process that leads to, as first stage, the quantity y and the price indexes q:

(1) $$\boldsymbol{y} = \left\{\sum_{i=1}^{n} \boldsymbol{x_i^{\rho}}\right\}^{1/\rho} \quad \text{and} \quad \boldsymbol{q} = \left\{\sum_{i=1}^{n} \boldsymbol{p_i^{-\frac{1}{\beta}}}\right\}^{-\beta}$$

where $\boldsymbol{\beta} = \frac{(1-\rho)}{\rho}$, from which follow optimal consumptions of y and of the numeraire good x_0:

(2) $$\boldsymbol{y} = \boldsymbol{I} * \frac{\boldsymbol{s(q)}}{\boldsymbol{q}} \quad \text{and} \quad \boldsymbol{x_0} = \boldsymbol{I}\,(\boldsymbol{1} - \boldsymbol{s(q)}).$$

The second stage leads to the demand function that each single firm faces:

(3) $$\boldsymbol{x_i} = \boldsymbol{y}\left(\frac{\boldsymbol{q}}{\boldsymbol{p_i}}\right)^{1/1-\rho}$$

that, through the quantity-index (**1**), gives us the elasticity of a single good price with respect the price-index:

$$\frac{\boldsymbol{\partial\, log(q)}}{\boldsymbol{\partial\, log\,(p_i)}} = \left(\frac{\boldsymbol{q}}{\boldsymbol{p_i}}\right)^{1/\beta}$$

elasticity that is of order $\frac{1}{n}$ as long as each price in the index has the same weight and magnitude;

$\boldsymbol{n}$ can be assumed as *sufficiently large* (that is a reasonable assumption, in step with what argued by Chamberlin): that is, the total figure of different plants producing each one its precise and unique variety is really high. In fact, also intuitively, in order to maximize the monopolistic power that each monopolistic-competitive firm has got, as we have seen Chamberlin had already noticed, each variety of the goods made in the economy is produced by just one firm.
The cross-price elasticity of demand is in the model of D-S ignored for simplicity, since the number of varieties is really high; this fact allowed for some critiques and then extension to the original paper (see in what follows here and note 26 and also Tirole (1988) for others approaches and detailed critiques).

Reminding Chamberlinian *d* curve (the "perceived" demand, that is the demand curve that an individual monopolistic-competitive firm faces, when all the other firms do not change their price), Dixit and Stiglitz could derive the equivalent elasticity for their model, that is the elasticity of a good compared to its own price:

$$\frac{\partial\, log(x_i)}{\partial\, log\,(p_i)} = \frac{-1}{(1-\rho)} = \frac{-(1+\beta)}{\beta}$$

Furthermore, even if the cross-elasticity of x_i with respect a good *j* (the *inter-sector* elasticity) is considered as negligible, if all prices would move, then the effect can be considerable, a fact that embodies the dynamic of the *D* curve of Chamberlinian thought.

It is intuitively correct that the elasticity of substitution depends positively to ρ (if ρ would be really close to 1, in fact, goods have been perfect substitutes so they would have a extreme low cross-elasticity and the variation of the consumption of a good compared to its price would be really low itself):

$$\frac{x_i}{x_j} = \left(\frac{p_j}{p_i}\right)^{\frac{1}{1-\rho}}$$

where then $\frac{1}{1-\rho}$ is that parameter of substitution.

The resource-allocation within industrial groups or sectors depends on the intersectoral elasticity, that governs also the existence of a unique equilibrium.

Considering the particular case of a symmetry among plants, $x_i = x$, D-S noted that

(4) $$x = \frac{Is(q)}{pn}$$

The symmetry-assumption will be really often used - actually, it will be a usual assumption in the monopolistically competitive market structure - in the following literature because of the great advantages it brings, simplifying a lot the exposition.

Many authors had dealt the matter of I not affected by changes in prices and in the price index; is the case of d'Aspremont *et alia* (1996),[25] who commented how keeping I fixed is a large approximation acceptable just because the D-S modified considering these effects is still sufficiently simple to be tractable[26], and of Heijdra and Yang (1993 - hereafter H-Y),[27] who dealt with the number of firms (and then, of varieties) and the omission of the influence of a price variation into the price-index offered by Dixit and Stiglitz (and, again, d'Aspremont and others, 1996, noticed that both H-Y and D-S both have underestimated the number of active firms in equilibrium).

H-Y underlined how the price-index's lack of variation must be seen as a drastic approximation, and that the assumption that n is "sufficiently large" to allow for that elasticity-effect to be equal to zero is a dangerous hypothesis, just because n is endogenously determined and its actual figure depends heavily from the values assigned to the model's parameters; the practical advantage of their method, that includes variations in the price-index, is that it enables to apply also Cobb-Douglas and Leontief production-functions to the monopolistic competition model drawn by Dixit and Stiglitz. The more recent research can, however, state that a departure from the CES may lead to less general results and that, nowadays, the CES specification is still the best one.

Still in 1993 Dixit and Stiglitz replied to H-Y with a very brief writing in which they highlighted how the "attack" brought from H-Y is in reality circumscribed to a special case in which H-Y got the desired price effect indeed, but introducing the assumption of the unitary elasticity of substitution among the various goods available and the *numeraire* one; this implies, at the end of the day, a loss in the generality of the model.

To conclude, Dixit and Stiglitz demonstrated how the dispute about the role of n is devoid of effective importance because the effect of the increasing of the number of active firms on the elasticity does not alter the *qualitative* results of the model (see also Helpman and Krugman, 1985).[28]

Aside the fact that, from a point of view, the relative weak point of the CES may be considered indeed the constant elasticity, a feature object of modifies and extensions through the years (see Zhelobodko *et alia*, 2012, matter of discussion in the last paragraph of this chapter), the bigger lacks of the D-S model are the absence of an explicit interest for firms' markup (that is, at the end of the day, exogenously fixed by the CES itself) and I and n kept constant, with no impact from the variations of the price-index.

But at the same time it is also true that these lacks does not influence the qualitative results of

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25 D'Aspremont, C., Dos Santos Ferreira, R., and Gérard-Varet, L., *On the Dixit-Stiglitz Model of Monopolistic Competition*, The American Economic Review, June 1996, Vol. 86 No. 3.

26 That effect, not taken into account in the original D-S model but included in the paper mentioned in the previous note, is what the three authors call the "Ford Effect" as d'Aspremont named it in two papers he had realized *cum alia* in 1990 and 1991.

27 Heijdra, B., and Yang, X., *Monopolistic Competition and Optimum Product Diversity: Comment*, American Economic Association, March 1993, Vol. 83 No. 1.

28 Helpman, E., and Krugman, P., *Market Structures and Foreign Trade*, MIT Press, Cambridge (MA), 1985.

a papers of fundamental relevance in the modern economics. We will see how literature has dealt with these important tasks, which withhold nothing to the absolute value of the original work of Dixit and Stiglitz.

Coming back to the model, the market equilibrium in the D-S scenario implies firms' profits-maximization, that leads to the *equilibrium* price $\boldsymbol{p_e}$:

(5) $$\boldsymbol{p_e = c\,(1+\beta) = \frac{c}{\rho}}$$

- where $\boldsymbol{c = p_i\left(1-(\beta/1+\beta)\right)}$ are the marginal costs - and to the free-entering of firms in the market until the marginal entrant would realize negative profits. The elegance and the extremely coherence of the model appear here in a neat way: the equilibrium price must be proportional to the marginal costs and is directly negatively affected by the parameter of substitution between goods available (the higher it is, the lower the market-power of a precise variety made by a single firm).

Firms start to operate setting marginal revenues equal to marginal costs; in that point, as we well known from the Chamberlinian hypothesis, *AR* curve (that is the price) exceeds the *AC* one, so firms do realize profits, involuntarily fostering other firms to enter and driving profits to zero, driving the economy to a moment in which no more firms enter in business and the equilibrium number of firm is reached.

To assume that the number n of firms is "sufficiently" large implies that firms split profits until the marginal plant sees its revenues equals to its fixed costs $\boldsymbol{a}$; in a symmetric scenario, this implies that all intra-marginal firms have zero profits too, and so, through the price equation and the symmetric quantity (**4**), we get the number of active firms:

(6) $$\boldsymbol{\frac{s(p_e n_e^{-\beta})}{n_e} = \frac{p_e * a}{\beta * c}}$$

This reaches to a unique equilibrium since $s(\cdot)$ is monotonic.

This means also that the Chamberlinian *D* curve shifts naturally to the left as n increases (each firm sees its market-share reducing because of the entrance of new competitors).

And, finally, this fact delivers also the output of a single, symmetric, active firm:

(7) $$\boldsymbol{x_e = \frac{a}{\beta * c}}$$

that expresses, omitting the equilibrium-price (that indeed in the original version is on the left of (**6**)), what the number of active firms is equal to: it is proportional to the fixed costs and inversely proportional to the marginal costs and to the parameter β (that can be seen as a sort of

parameter of elasticity of the price).

The last step Dixit and Stiglitz made in the CES case was to compare the constrained and the unconstrained *optima*. As we have already discussed, the first-best *equilibrium* leads to losses for firms; the solution available to a public regulator is letting firms making those losses, in order to realize and than cover those negative profits by a lump-sum tax transfer due to the consumers in favor of the firms.

The constrained *optimum* does not allow for these lump-sum transfers. Algebraic calculations and technical passages are here once again omitted; anyway, the idea to follow in order to get the constrained *optimum* is to maximize the utility u (or minimizing the price-index q) in order to get constrained optimal x, p and n under the usual demand function.

The result is surprising: the equilibrium-constrained price is equal to the equilibrium price **(5)** (point **C** in **Figure 2**). The number of firms will also be the same of the market outcome and can be obtained by the usual price, because other assumptions are still untouched.

So in this monopolistically competitive economic environment constrained *optimum* deprived of the tool of the lump-sum taxation the equilibrium is the same of the market outcome with monopolistic competition among firms.

This is, I think, a result that itself may justify the success of the paper.

The unconstrained *optimum* is a little bit more complex to reach, at least in its final results, but intuitively it should have an higher net welfare than the two previous cases.

The lump-sum transfers from consumers to firms now allowed must be equal to $a * n$, that is the total number of active firms times the fixed costs (and so $I = 1 - a * n$); price will equate marginal costs, then, as in the perfect competition scenario.

The output for each firm is again the same of (**7**): this is as surprising as previously we discovered that in the constrained *optimum* the price is the same of the market output (point **A** in Figure 2). This fact opened a huge space for debating the misinterpreted point of the so-called "excess-capacity" of the original, Chamberlinian model: the unconstrained *optimum* does not reached that excess of capacity in the moment that firms do not operate at the minimum of their average costs; the optimal behavior of the economy is not to push the output at its theoretical maximum, given the assumptions (mainly, the one about the *AC*) of the model and given, above all, the concept of preference for the variety, so relevant in the continuation of our work.

What actually changes in the unconstrained *optimum* is the number of firms (that turns out to be the highest one) - and with it, so, the available varieties and then the total surplus of the economy, as we can see in a graphical way in Figure 2 - as also changes the price-index level, that is the lowest one, since the first two cases are equal, too.

Point **B** is the point in which the 45° line that joins the origin to C meets the indifference curve of the unconstrained optimum; for homotheticity the indifference curves in B and C must be parallel and so, as is clear, this last case represents an increase in y.

Figure 2 clearly shows these exposed results: unconstrained *optimum* **A** reaches the same output per firm of the other cases, with firms all of the same size of course, so then more variety,

lower prices, the highest net welfare gain, and finally can be for sure labeled as our first-best equilibrium, where the constrained-one, more realistic in its basic assumption, coincides with the market *equilibrium* as the second-best outcome.

The huge value of the unconstrained optimum analysis is to put an end to the misunderstood, and actually wrong, idea of the not exploited output-capacity of the monopolistic competition model: that further production does exists but is not *efficient* (in a strict economics meaning) for a firm to exploit it.

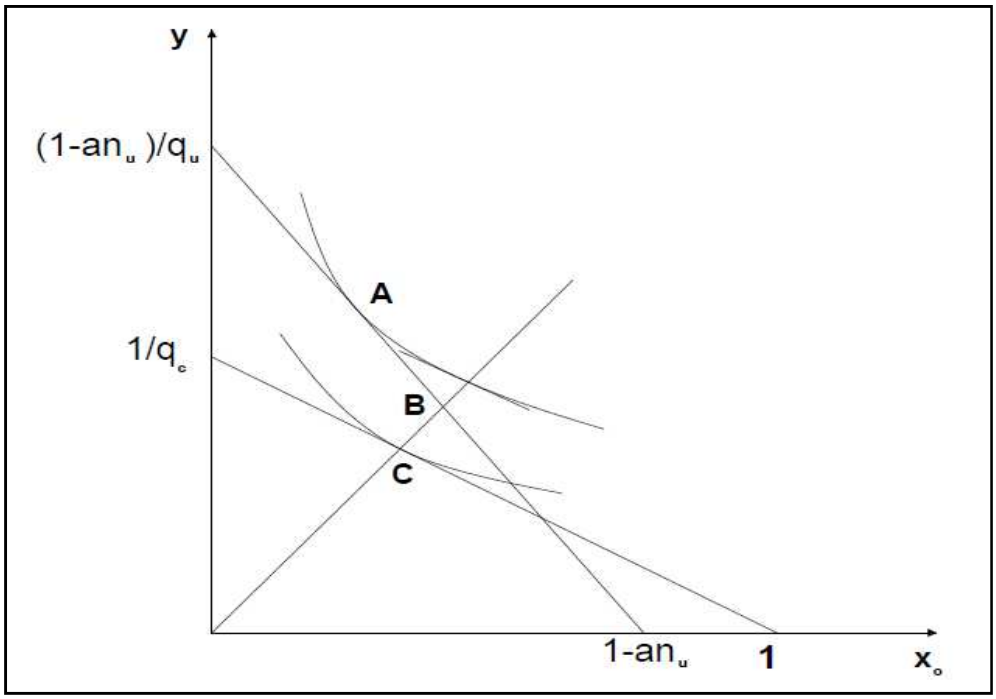

*Figure 2 - Constrained (**C**) and Unconstrained (**A**)* Optima *in the Dixit-Stiglitz Model (1977)*

The greatness of the D-S model lies in the fact that it correctly embodies the ideas and the intuitions of Chamberlin in a mathematical framework absolutely plausible and tractable, using the universal language that mathematics is, and moreover adopting as key tool the successful economic utility-specification of the CES function that results to fit like a glove to the monopolistic competition environment.

The D-S conventional monopolistic competitive framework, whose success is due to is

adaptability to the flexible and prominent CES utility-function and to the general mathematically successful base, will always have the credit of have given a tractable and manageable layout to the great - although analytically lacking - intuition of Chamberlin.

It can be useful now to resume the main technical features and results, in the probably simplest way possible, of the monopolistic competition theory as developed by Dixit and Stiglitz and remodeled nowadays, and its direct effects and consequences involving international trade.[29]

The **fundamental hypotheseis** of the basic monopolistic competition model can be summarized this way:

- To ensure a *monopolistic* power to each single firm, it is assumed that each firm differentiate its production from the others', producing a single variety of the range of goods made in the economy by itself and its competitors, a variety slightly different from all the other ones;

- To ensure them a *competitive* power, thought, each firms meant to take as given the prices of its rivals, with no chance of strategic interactions and influence on them: it ignores the impact of its price on other firms' prices. So, the monopolistic-competitive firms acts like a monopolist even if merged in a competitive economic environment;

- The hypothesis of *symmetry* for firms ensures that all n firms face the same demand and, having the same cost-structure, charge the same price obtaining the fraction $\frac{1}{n}$ of the market. The total output is assumed to be unaffected by the price charged: this may be a quite unrealistic - at least for some markets - assumption, spent for the aim of focusing on the competition among firms and in order to simplify the algebraic analysis. This also means that firms can only gain market share at other firms' expense;

- There are *no entrance or exit barriers* for firms in the market;

- Dixit and Stiglitz assumed, as is now usual because realistic, that the number n of firms is *large*, large enough to avoid impact on cross-elasticities of products. Despite this may not be in some cases a fully realistic consequence, it has been accepted in literature because this starting hypothesis about n is, at the end of the day, feasible and really important and useful in the context of the model, that is - it is good to remember it - always an approximation of reality;

- It is assumed a situation of *full employment* in the economy, to stabilize salaries and

29 See Krugman, P., Melitz, M., and Obstfeld, M., *International Economics - Theory & Policy*, IX edition (Global Edition), Pearson, Harlow 2012, and also, for more technical details, Salop, S., *Monopolistic Competition with Outside Goods*, Bell Journal of Economics, 1979.

then prices and ensure *symmetry* among firms. This assumption has been fully accepted and acquired by the literature, too.

The economic/algebraic **method** used to reach the market equilibrium can be quickly illustrated in three main steps, always avoiding useless mathematical passages:

- The first step is to define the intuitive relation among *AC* and n, that must be positive: the more the firms, the lower the *ceteris paribus*-output and then the higher the average costs.
  This fact pushes positive profits to zero, stopping the (anyway, free) entrance of firms that drove the previously positive profits to zero (**C1** curve in **Figure 3**):

$$\boldsymbol{AC} = {}^{\boldsymbol{F}}/_{\boldsymbol{Q}} + \boldsymbol{c} = \boldsymbol{n} * \left({}^{\boldsymbol{F}}/_{\boldsymbol{q}}\right) + \boldsymbol{c}$$

  where $\boldsymbol{F}$ are the fixed costs, $\boldsymbol{Q}$ is the total output of the industry and $\boldsymbol{q}$ is the output of each single firm;

- The second step is to obtain the relation among price and n, n that is once again crucial and directcly involved in the main conceptual passages of the model. This relation is clearly negative: the more the firms, the higher the competition and the lower the equilibrium market price $\boldsymbol{P}$ (**P** curve in Figure 3) because the charged markup that increases the marginal cost is clearly decreasing in n:

$$\boldsymbol{P} = \boldsymbol{c} + \frac{\boldsymbol{1}}{(\boldsymbol{b} * \boldsymbol{n})}$$

  where $\boldsymbol{b}$ is the constant elasticity of consumption of a good (that means, the elasticity of the production of a firm, then) with respect its price (that is, the responsiveness of a firm's sales with respect the price applied);

- The common, crucial aspect of the two last equations is n: it directly links C and P curves. Firms enter in the market until there are positive profits; this entering drives down the price to the equilibrium and reduces the market share of each firm, increasing AC: their intersection is the equilibrium in which there are no more reasons to enter in the market and in long-run profits go to zero, defining n. If we would have a lower number of firms, the price would be higher, at a lower AC simultaneously: a monopoly case. Instead, with more firms than in the equilibrium, the situation becomes the opposite and firms would see losses.

The great **results** obtained by Dixit and Stiglitz surely are:

- The construction of a neat and coherent model, able to formalize actually in a manageable way the intuition of Chamberlin, giving to the research a terrific boost applied to the international economic theories with a huge success;
- The demonstration that the idea of the existence of an "excess of capacity" is a mistake, since the market *equilibrium* and the constrained *optimum* (with no lump-sum taxation on consumers to cover firms' losses in order to have more variety of available goods) reach the same output and price: market outcome and second-best *optima* coincide.

The main **lacks and restrictive assumptions** that characterize the D-S model with the CES specification can be reassumed in this way:

- There is *no impact on income* from the variations in the price index, and the same for the number of firms; the D-S model is not a dynamic model as the well-known Melitz model (2003), and in one sense this is of course a limitation.
- Prices and markup are *not* affected by firms' entry or exit and by the market size;
- The same CES specification for the utility function of the consumers implies that the elasticity of substitution is, indeed, always constant across varieties;
- The assumptions of a "sufficiently large" figure for n is actually useful and can be considered a realistic hypothesis, but it is anyway a simplification and implies that a price-variation of good has no impact on the others and then on the elasticity of the consumption with respect the price index, thanks to the fact that one single variety has a too small relative weight on the whole bunch of goods;
- Firms' size and markups - applied markup that comes out to be constant - are independent from the number of consumers and from their geographical location (we will see how the Krugman model deals with this fact).

Finally, **Figure 3**, instead, can easily synthesizes in the usual effective way the basic **effects of trade**, that are our ultimate area of interest, in a monopolistic competition model like the D-S one: merging two or more markets by trade has the same effect of the growing of a single, national, autarkical market: there will be more firms, and higher sales, even if in the long-run this situation encourage new firms to enter into business and to compete, driving profits to zero.

When a firm starts to sell also abroad, it conquers a new market share, seeing its output growing and its AC declining: it is the case of the **C2** curve in the graph. The P curve, instead, is not affected by the increase in the production.

The final results given by the opening to international trade in this simple scenario are then lower prices and more firms, which mean more varieties and then higher utility for consumers.

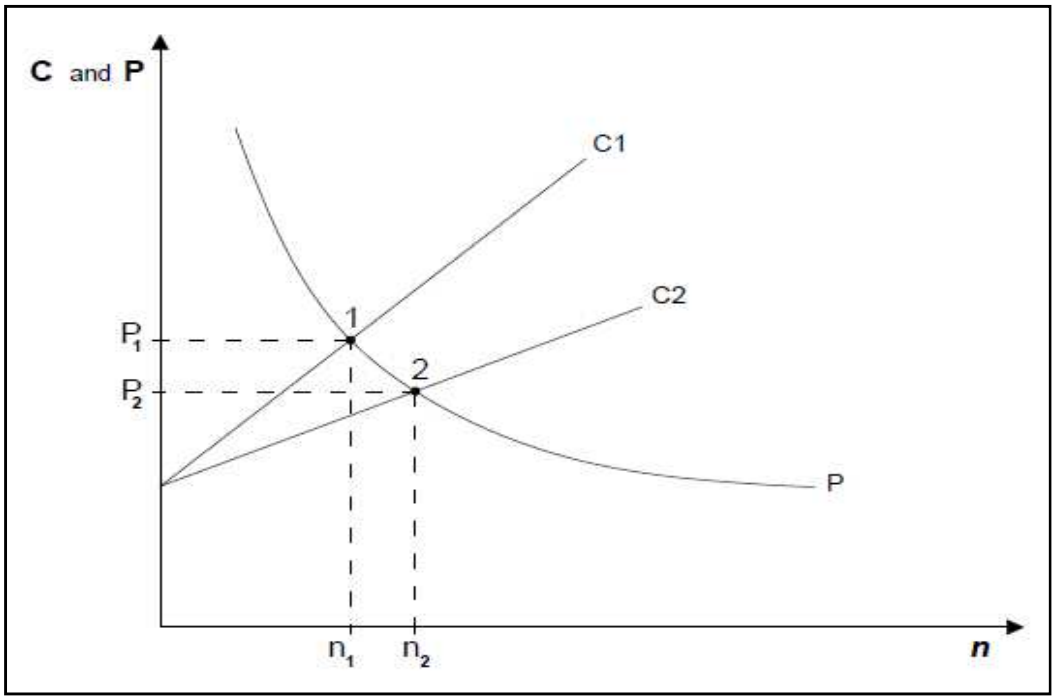

Figure 3 - The Effects of the Opening to Trade (from **C1** *to* **C2***) in the Basic Monopolistically Competitive Market Structure*

Let now see the first relevant research consequence of the D-S model, applied to the international trade world by Paul Krugman a few years after Dixit and Stiglitz had made easy to use the model of monopolistic competition.

1979 / 1980 - Two Times Krugman

In 1979 Paul Krugman put the basis for the new international trade theory with the first of his two great papers of those years, *Increasing Returns, Monopolistic Competition and International Trade.*[30] Using the monopolistic competition market-structure inherited by Dixit and Stiglitz, Krugman developed in a new way the not so much exploited (in those last decades) international trade theory in order to find an explanation to the worldwide commerce among industrialized countries, and precisely to the trade between *similar* countries (that is, countries that have the actually same market structure, the same technologies, produce the same goods, and anyway commerce among them those "equivalent" varieties, following the famous Linder Hypothesis.). He tried to find, at the end of the day, a reason for the global commerce between advanced nations.

Before briefly discussing the first of these two researches, it is compulsory to spend a few words about the fundamental concept of economies of scale - internal and external - as it concerns the international trade theory, since this particular micro-assumption for firms will be one of the main feature of the monopolistic competition applied to the international trade.

Our useful support here is the book by Krugman, Melitz and Obstfeld *International Economics.*[31]

The **economies of scale** - also referred to as **increasing returns** for firms or industries - are a micro-feature of the (mainly modern) firm-theory. Their meaning is easily stated: the larger the scale (the level) of production, the higher the efficiency for a single firm or an industry as a whole.

But why this distinction between single firms and an entire industry?

Because scale-economies has been seen in two different shades: internal or external (and unfortunately their mix is really difficult to deal with). Internal economies of scale happen when the productivity depends on the size of a single firm and not necessarily on that of the whole industry; external increasing returns occur when the cost per unit of output depends on the size of the entire industry and it is not necessarily affected by the single firms' size.

This latter case may involve the case of many small firms that can be seen as perfectly competitive; the former case, instead, fits better to the case of a market with few firms, maybe with barriers at the entrance as the aerospatial or the automotive ones, and can easily lead to imperfect competitive market structures (as the monopolistic competition or the oligopolies as Bertrand and Cournot).

Once again, Alfred Marshall in his *Principles* was the first one to deal with this phenomenon at the sight of the industrial districts or clusters of his age that could not be explained just thanks to geographical/natural or other exogenous reasons, as the cases of the industrial concentrations in Northampton and Sheffield in his country, that could not count on the reasons of development

30 Krugman, P., *Increasing Returns, Monopolistic Competition and International Trade*, Journal of International Economics, 1979.

31 See note 29.

of London, or Paris, or of the Ruhr-basin, Milan and so on.[32]

Modern examples of those clusters are New York and London for banking and financial services, many Chinese towns for manufactures (buttons, cigarette-lighters, underwear, zips, magnetic-tape heads...), Bangalore in India for info-services, Hollywood for entertainment industry and the Silicon Valley for high-tech, computer, semiconductor and microprocessors industry.

Marshall argued that there are three reasons for these "unexpected" industrial concentrations: they constitute an incentive to the concentration of specialized suppliers, they foster a pooling of specialized workers and incentives knowledge spillovers.[33] Paul Romer also developed the idea of industrial concentrations as sources of positive externalities that foster growth.[34]

How - in a few words - can economies of scale enter in the contest of the international trade in a crucial way?

They can because, opening up to trade with (also similar) foreign countries and their market, a nation can then exploit the increasing returns that are naturally or historically present in its economy, maybe focusing its productions in those goods in which it is more efficient (then, probably, less for number of varieties than before opening to trade - a chance that heavily tastes of Ricardian flavor) and eventually leaving other ones, where the country is not efficient relatively to the others, to the new commercial partners, if they are able to exploit their own scale-economies.

In any case, with departing from the possibility of concentrate the production on a smaller range of varieties, the results are, for the theory, more varieties for all the consumers, lower prices and a higher net total welfare (this is avoiding much more complex considerations).

This type of commerce is called "intra-industry trade", since it leads to exchanges of similar goods between similar countries. It is a very different, and more sophisticated, result than the first models of international trade, like the pure Ricardian one, or the Specific-Factors model, or the Heckscher-Ohlin model, too, in which different productions, based on different technologies (that is the Ricardian comparative advantage) or different endowments of productive resources,

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32 For a recent econometric work inspired to the initial idea of Marshall, see Henderson, V., *Marshall's Scale Economies*, Journal of Urban Economics, 2003, on the presence and the effects of so-called "dynamic externalities".

33 Jacobs had a different thesis, that for industrial clusters are more important the "exogenous" effects that may come from other economic sources that are more diversified than an industrial concentration, and then that cities are the best places for economic growth because they can supply an higher number of different incentives and positive externalities than what industries can give to themselves (see Jacobs, J., *The Economy of Cities*, Random House, New York 1969). The opposition between his hypothesis and the one of Marshallian heritage - also referred as the MAR model, from Marshall-Arrow (in *The Economic Implications of Learning by Doing*, Review of Economic Studies, 1962)- Romer (see note 34), the three most influence authors who developed this idea with Glaeser *et alia* (included Shleifer, A., *Growth in Cities*, Journal of Political Economy, 1992)- has been debated in Beaudry, C., and Schiffauerova, A., *Who Is Right, Marshall or Jacobs? The Localization Versus Urbanization Debate*, Elsevier, 1998.

34 Romer, P., *Endogenous Technological Change*, The Journal of Political Economy, October 1990, Vol. 98 No. 5, and, mainly, *Increasing Returns and Long-run Growth*, Rochester Center for Economic Research, 1985; see also Henderson, V., *Externalities and Industrial Development*, Journal of Urban Economics, 1997, on the presence and the impact of externalities on corporations and non-affiliated firms and on different types of industries.

are the reasons for trading.[35]

In the Krugman model (henceforth also **KM**), as we are going to see, nations trade of course with the final aim of gaining in variety of available goods, but as first thing in order to exploit economies of scale, whose exploitation is permitted exactly by the foreign trade and the "exotic" tastes of foreign consumers.

We well know that these reasons are important but no more sufficient in our days; with a paper of 2006, Broda and Weinstein estimated that in the U.S. the number of imported goods is tripled in the period 1972-2001.[36] Elhanan Helpman, with two important papers, highlighted the evolving structure and the particular features of the "modern" international commerce and how it can be well modeled with the monopolistically competitive market structure.[37] The monopolistic competition as source of international commerce has been exploited also by Kelvin Lancaster in 1980.[38]

Trade costs, furthermore, have been often ignored in theory, especially at the beginning of the research based on the monopolistic competition, but at the same time are obviously real and constitute a problem to deal with, and then theories must consider them: to ignore them as we are doing by now is not correct, but also it does not take out nothing from the value of what we have seen in the last paragraph and what we are going to see in this one and we will add them in the following section. We will see, especially in the following section with the Melitz model and in second chapter how the inclusion of trade costs opens great scenarios to the theoretical development of the international trade theory based on the monopolistic competition.

To conclude, the introduction of such a micro-foundation for firms is a great success of the international trade research, but nevertheless it necessarily leads to particular market-structures as the monopolistic competition one we have seen.

Krugman developed his model in order to explain, through internal economies of scale based on the D-S model, the pattern of trade among really similar and, particularly, advanced industrial countries, without assuming differences in technologies or endowments of production-factors: the two countries thought of by Krugman in his papers are perfectly identical. We may think about the trade between U.S. and Japan or Germany, or between France and Italy, that are really similar in some of their economic features. How to justify this actual commerce? Balassa (and

35 See Heckscher, Eli, *The Effect of Foreign Trade on the Distribution of Income*, Ekonomisk Tidskriff, 1919, and Ohlin, Bertil, *Interregional and International Trade*, Harvard University Press, Cambridge (MA), 1933. See also Heckscher, E., and Ohlin, B., *Heckscher-Ohlin Trade Theory*, MIT Press, Cambridge (MA), 1991.

36 Broda, C., and Weinstein, D., *Globalization and the Gain from Variety*, Quarterly Journal of Economics, April 2006.

37 Helpman, E., *Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries*, Journal of Japanese and International Economies, 1987, where are underlined some positive evidences in favor of the increasing returns and the differentiation in products in the present foreign commerce, and *The Structure of Foreign Trade*, Journal of Economic Perspective, 1999, that again sustains the model of monopolistic competition. See also his *Monopolistic Competition in Trade Theory*, Princeton University, Cambridge (MA) 1990. Can be useful also the paper of Hummels, D., and Levinsohn, J., *Monopolistic Competition and International Trade: Reconsidering the Evidence*, Quarterly Journal of Economics, August 1995, Vol. 110 No. 3.

38 Lancaster, K., *Intra-Industry Trade Under Perfect Monopolistic Competition*, Journal of International Economics, 1980.

Kravis for U.S. in particular) a few years before Krugman had already argued that, among similar, industrialized nations, economies of scale may have a crucial role to explain their common commerce, but without giving a technical justification.[39]

Gruber and Lloyd[40] and Barker[41] - the latter one on the path of Linder but focusing on the role of the *real* income *per capita* - also argued that increasing returns may justify the increasing trade between similar countries, following the well-known Linder Hypothesis[42] and against - like Linder and, before him, Leontief[43] - the Heckscher-Ohlin model: similar countries' industries may face similar demands and indeed commerce varieties of their goods.

Gray[44] (who argued trade of similar products) and Negishi[45] (who dealt with the increasing returns as a economic justification for the exports of some firms) also tried to use economies of scale in order to explain the foreign commerce among similar countries but without reaching the point of Krugman, who was the first to undoubtedly demonstrate that this fact is due to the so-called "**love for variety**" (**LFV**) of consumers (meaning that, *ceteris paribus*, a consumer is willing to borrow a lower consumption for more variety in his consumption), a concept that, as we have already seen, the same Chamberlin had already expressed, even if not exploiting it completely, with his first draft of the monopolistic competition theory.

The analysis of Krugman starts in a closed economy in order to derive a complete (but not general, as he highlighted) model, assuming as first thing a specification for the utility U of consumers that depends on their consumption x:

39 See the book of Balassa, B., *Trade Liberalization Among Industrial Countries*, McGraw-Hill, New York 1967, and the work for the Commission on International Trade and Investment Policy of Kravis, I., *The Current Case for Import Limitations*, U.S. Government Printing Office, Washington 1971.

40 Gruber, H., and Lloyd, P., *Intra-industry Trade*, MacMillan, London 1975. See also Chacholiades, M., *Increasing Returns and the Theory of Comparative Advantage*, Southern Economic Journal, 1970, for an analysis of the difference between those two reasons for trading.

41 Barker, T. S., *International Trade and Economic Growth: an Alternative to the Neoclassical Approach*, Cambridge Journal of Economics, 1977.

42 Linder, S. B., *An Essay on Trade and Transformation*, John Wiley, New York 1961: countries with similar demands will develop similar industries and will trade differentiated goods when they have almost the same *per capita* income; then trade flows will follow eventual differences in income. See also, for recent empirical evidence, Kugler, M., and Verhoogen, E., *Prices, Plant Size and Product Quality*, Review of Economic Studies, 2012.

43 Leontief, W., *Domestic Production and Foreign Trade: The American Capital Position Re-examined*, Proceeding of the American Philosophical Society, 1953. He was the first to find out how the H-O model empirically did not work, at least in the U.S. case.

44 Gray, P., *Two-way International Trade Manufacturers: A Theoretical Underpinning*, Weltwirtschaftliches Archiv, 1973: Gray argued that there is an "Export Price Range" within which a firm may export or not.

45 Negishi, T., *Marshallian External Economies and Gains from Trade Between Similar Countries*, Review of Economic Studies, 1969.

$$\boldsymbol{U} = \sum_{\boldsymbol{i=1}}^{\boldsymbol{n}} \boldsymbol{\omega(x_i)}$$

with $\omega' > 0$ and $\omega'' < 0$; in this utility-function all produced goods (as usual, one good for each single firm of the total large number n) enter symmetrically. Consumers are also subjected to the usual budget-constraint such that their income w must be equal to their total consumption in goods.

Krugman defined also the elasticity ε_i of the demand with respect the consumption faced by each firm as:

$$\boldsymbol{\varepsilon_i} = -\frac{\boldsymbol{\omega'}}{\boldsymbol{\omega'' x_i}}$$

There is just one production-factor, labor l, for each firm, taken from the total labor-force L.

The production-function of the good x_i shows, as obvious, decreasing *AC* and constant *MC*:

(8) $$\boldsymbol{l = \alpha + \beta q_i}$$

with α and β as fixed and variable costs and where q is the quantity produced.

Subscripts *i* can be omitted thanks to the symmetry of the model.

All the production of a good must be consumed, so

(9) $$\boldsymbol{q = Lx},$$

and all the labor-force is assumed as employed (**full-employment** is a strong hypothesis but does not alter the aim of this particular analysis):

$$\boldsymbol{L} = \sum_{\boldsymbol{n}} (\boldsymbol{l}) = \sum_{\boldsymbol{n}} (\boldsymbol{\alpha + \beta x})$$

The utility and profit maximizations then give us the three equations for the equilibrium.

Once again, is underlined by the author how, since the number of varieties is large and all of them are consumed in the same amount, the price of one of them has no effect in the total bulk of goods, so the marginal utility of income can be assumed as fixed and the cross-elasticities of price have the same effect as in the D-S model, that is, null.

The *equilibrium* price, once maximized profits by firms and allowing free-entry until those profits are driven to zero, is:

(10) $$\boldsymbol{p_i = \frac{\varepsilon}{\varepsilon - 1}\,\beta w}$$

that positively depends on variable costs and on the elasticity of consumption (that decreases as varieties increase) that in turn depends on output.

The price can be derived from the **zero-profits condition**:

(11) $$\boldsymbol{0 = pq - w\,(\alpha + \beta q)} \quad \text{or} \quad \boldsymbol{p = w\left(\beta + \frac{\alpha}{q}\right) = w\left(\beta + \frac{q}{Lx}\right)}$$

from which can then be easily derived also the output per firm, that is:

(12) $$\boldsymbol{q = w\left(\frac{\alpha}{\frac{p}{w} - \beta}\right)}.$$

From one of these last equations[46] one can easily derive, through the assumption of full-employment, the *equilibrium* number of firms:

(13) $$\boldsymbol{n = \frac{L}{\alpha + \beta q}}$$

It is clear that the output per firm is inversely proportional to n.

Since the closed-economy stands on this extremely well-defined, neat and solid bases, then Krugman explores the field of the international trade (touching also the similar cases of a growth in the labor-force and of massive international migrations).[47]

The basic case, that is the growth in labor force, shows the following pattern: an increase in L produces the results we have seen at the end of the previous section with the help of the **Figure 3**: more varieties at a lower price.

The original graph of Krugman for his paper of 1979 is here replied (**Figure 4**) because it is the direct analytical representation of his equations (**18** - curve **P-P**) and (**19** - curve **Z-Z** before L increases and **Z'-Z'** after that).

46 These last two curves determine the Chamberlinian "tangency solution" for the monopolistic-competitive market.

47 Krugman obtained that his model, in the case of factor-mobility, reached almost the same result of the Heckscher-Ohlin model that, as demonstrated by Robert Mundell (*International Trade and Factor Mobility*, American Economic Review, 1957), shows how international trade and factor-mobility may be substitutes, since factor movements would be caused by barriers to trade, and *viceversa*.

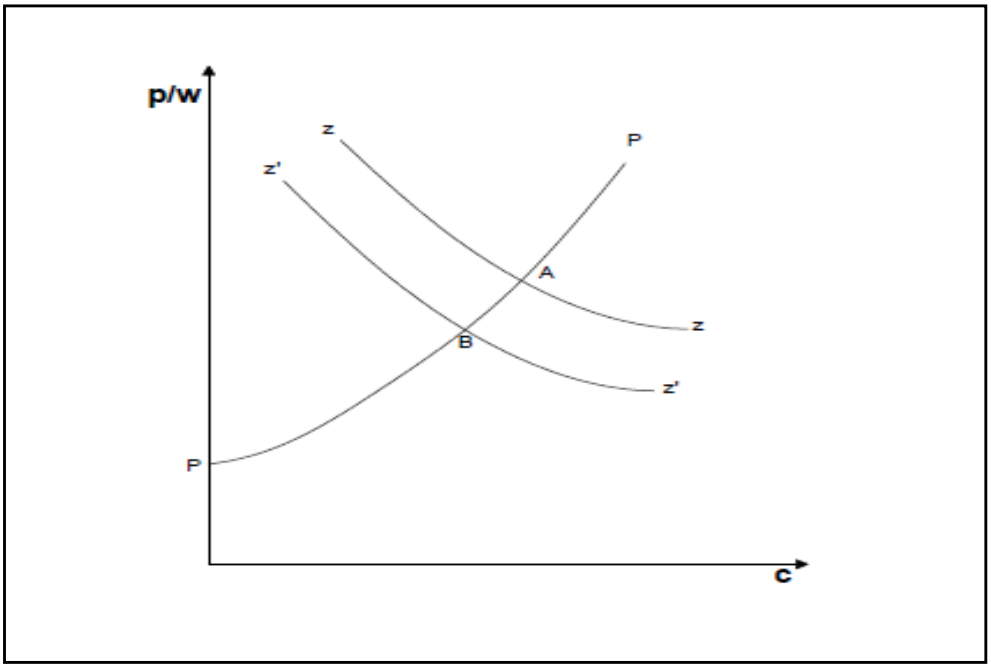

Figure 4 - The effects of an increase in L *(or of the opening up to trade) in the Krugman model (1979)*

The same effects of an increase in L happen if the close economy opens to trade with an identical partner at **zero transport costs**. Symmetry ensures same wages and prices in the two countries, and the overall effect of trade is the one we have already seen.

The last formulation of equation (**19)** shows how output per firm rises, as the same does the number of firms, while the price falls (curve **Z'-Z'**); the welfare of the consumers increases because the real wage raises (see again equation 19) and there is more variety of goods, in fact we have higher n, even if the direction, the "quality" of trade is not determine (so we cannot say which country export what, since and n is still proportional to the national labor forces, as in the equation (20), and it may be that a single variety is produced in one of two countries that do not compete for the same punctual market of a single variety).

It is also possible a "shuffle" in the varieties, and each country will then produce its best varieties; but the important point here is that firms can now exploit economies of scale, reducing prices because entering of new firms that rise the consumers' welfare offering new varieties and pushing prices to the bottom.

So *the quantity*, the volume, of the trade, even if not the precise *quality*, its direction, is determined, and it is clear that this trade has positive effects at least for consumers.

Notice that, as in the D-S model, in the KM the markup is obviously constant.

The second of the two main Krugman's papers of our interest is the *Scale Economies, Product Differentiation and the Pattern of Trade*, published one year after the first one.[48]

When that paper appeared, the international trade theory was a branch in turmoil after many years of "rest", thanks to the contributions of Dixit and Stiglitz, Krugman himself and others, and the idea of the comparative advantages as only source of trade was at that time no more feasible.

The relative importance of this second paper is for some aspects lower than the innovative relevance of *Increasing Returns*, but it added some really important special cases about transport costs, the so-called "home-market effect" and a brief introduction to other possible extensions, such that often in literature the "Krugman model" *par excellence* is the one of 1980, that is seen as the ultimate and refined version of the one of 1979. We are going to see all of these important points in a rapid way, omitting almost the entire algebra, that is derived from *Increasing Returns* for the basis, and moving directly to the results.[49]

Once again, the economic environment is the monopolistically competitive one, and once again the aim of the paper is to find a reason for the international trade between similar countries with developed and well-differentiated (meaning that they produce a large variety of products) industries.

The first goal of Krugman with *Scale Economies* was to extend the *Increasing Returns* framework starting with a particular formulation of transport costs.[50]

Transport costs are assumed in the peculiar way of the so-called "iceberg-costs": this means that a fraction $\mathbf{1} - \boldsymbol{g}$ of any shipping of goods exported is considered lost during the travel.

Krugman obtained that the elasticity of the foreign goods demand (i.e., the demand of imported goods) is equal to the one for national (*i.e.*, domestic) goods: iceberg transportation costs has no effect on prices as on $\boldsymbol{n}$ or the firms' output too.

Instead, wages can be affected by transportation: is the first signal of what will follow in Krugman's exposition, the so-called "home-market effect".

The ultimate effect of the lost of some goods during the transport, together with the initial assumptions about costs, demand and utility, is that the larger country among the two involved will have higher wages.

This happens exactly thanks to the home-market effect, that makes wages in the bigger

48 Krugman, P., *Scale Economies, Product Differentiation and the Pattern of Trade*, American Economic Review, December 1980.

49 Other two additions to these two first fundamental papers of Paul Krugman are, both published in the Journal of Political Economy, his *Intraindustry Specialization and the Gains from Trade* (1981) and *Increasing Returns and Economic Geography* (1991); Krugman developed, too, other two books with Elhanan Helpman: *Market Structures and Foreign Trade* (1985) and *Trade Policy and Market Structures* (1989), both edited by the MIT Press. Another empirical work often quoted related to this literature is *Scale Economies and the Volume of Trade*, by James Harrigan (1994), in Review of Economics and Statistics.

50 See Chilas, J., and Hufbauer, G., *Specialization by Industrial Countries: Extent and Consequences*, in Herbert Giersch, ed., *The International Division of Labor*, Tübingen 1974, where they illustrate the incompatibility of the actual patter of trade with the comparative models.

country to be higher, because - given the fact that transport costs are the same for all the active plants - a firm would prefer to produce near the largest market, that is, the larger country, to avoid shipping and transportation costs to deliver its product the bigger fraction of its consumers, minimizing the expenditure for shipping; as a consequence, in order to get full employment, workers must receive an higher salary to balance the advantage of the "avoided", saved, transportation costs that firms benefit, keeping equal the prices in the two countries.

This is a collateral effect of the model, that then has the great worth to be feasible also for the home-market effect, an "endogenous" consequence that advantages workers in the bigger country.

Before going into the matter of the home-market effect as it has been treated and exploited by Krugman, it can be useful to spend a few words to clarify what the so-called market-effect actually is and its genesis and evolution in the context of the modern international trade theory.

With "**home-market effect**" (hereafter, also just "**HME**") it is meant the (theoretical, not necessarily empirical) phenomenon of the industrial concentration in larger markets: when returns to scale encourage firms to operate abroad, firms will base themselves in the country where most of its products are consumed in order to minimize transportation costs; we are going to see how in the Krugman model the "concentrated" industry, in a two-industries economy, will be a net exporter, implicitly confirming the HME, and as we have already seen, it implies that the population in the larger country will have the benefit of higher wages as trade-off for the transport costs saved.

The HME implies a link between market-size and exports that, in the trade models solely based on the concept of comparative advantage or differences in endowments, is not accounted for; it has been first proposed by Corden[51] in 1970 and then developed by Krugman, partially proving and partially providing alterations to the Linder Hypothesis: recent researches assess how the HME confirms Linder's intuition, that national internal demand determines also national exports since nations with similar demands tend to be commercial partners, but does not support his claim that differences in countries' preferences do obstacle trade.

For a resume of papers about HME, see the last section of this chapter.

The last part of the Krugman (1980) model then illustrates the HME that naturally emerges in the model.

The model stays almost unvaried than the basic closed-economy one, with the only difference that the total national production of both countries is split into two parts as the number of classes of products that Krugman attributed to each countries.

The great result of this discussion is the possibility of the *specialization* of the industries on the production of the class of varieties with the larger *home* market, in order to minimize the transportation costs for that main market, and then being a net exporter of that class of goods.

This is a great result, correct - with the limits of its assumptions - analytically but also

51 Corden, M., *A Note on Economies of Scale, the Size of the Domestic Market and the Pattern of Trade*, in McDougall, I. A., and Snape, R. H., *Studies in International Economics*, North-Holland, Amsterdam 1970.

intuitively, and it is an indirect confirm of (the core of) the Linder Hypothesis, and I think it is also for some aspects in line with the Ricardian comparative advantage through the idea of specialization into one of the two classes of the national industry.

There is always the possibility of non-specialization: this fact positively depends on the transport costs and on the effectiveness of the increasing returns for an industry. Such a case is an intermediate situation, in which both countries will produce, and then both import and export, the two classes of products, but they will always be net exporters of the class which have the larger domestic market, and then will also be a net importer of the other class.

How this nature of the international trade may affect the distribution of wealth among countries and can touch other important topics of public interest has been described, for example, in the famous paper of Krugman and Venables *Globalization and the Inequality of Nations* (1995).[52]

2003 - The Melitz Model

The step that naturally could follow the great innovations Krugman has introduced was to develop a scenario in which the multiform nature of the economic human activity was actually multiform also at the firm level, developing in same ways a sort of *heterogeneity* for industrial plants.

This is what Marc Melitz did, publishing his great work *The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity* in 2003.[53]

The huge value of that paper is the development of a *dynamic* industry model with **heterogeneous firms** in the international trade context, in order to analyze the effect of trade among nations on the reallocation of monopolistically competitive firms and, eventually, of the overall social welfare too.

We will see later the parallelism that exists between the Melitz (2003) and the Krugman (1980) models, that are closely linked.

The dynamic structure of the Melitz model (hereafter, also **MM**) to explain the endogenous evolution and plants-selection of the industry is derived by the work of Hopenhayn *Entry, Exit and Firm Dynamics in Long-run Equilibrium*, while the dynamic computation of firms' value id

52 Krugman, P., and Venables, A., *Globalization and the Inequality of Nations*, The Quarterly Journal of Economics, November 1995. See also the essay of Krugman for the Stanford University published in 1995 *Growing World Trade: Causes and Consequences*.

53 Melitz, M., *The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity*, Econometrica, November 2003.

inspired by the Hopenhayn's paper *Exit, Selection and the Value of Firms*, in which the author had introduced also differences in productivity-levels of the firms, that are the other great feature of the MM, that adopt, instead of perfect competition as Hopenhayn, the winning monopolistic competition model as framework.[54]

Indeed, Melitz generated heterogeneity among firms assuming that firms may have different productivity, a thing that influences their nature, behavior and then their life in the open-economy context.[55]

The MM is based on empirical evidence that had to be adequately motivated: the model lies on the idea that exporting firms have higher productivity, and thanks to their better performance they can survive to the competition brought by foreign firms', and export their own goods, obtaining more profits thanks to the markets of new exploitation, while other less productive firms will not export, seeing lower profits or maybe facing the death.

And these empirical evidences Melitz needed were in late 2003 abundant. Research of those years indeed clearly showed the presence of differences in productivity among firms, where exporting ones are necessarily more productive, and how within some sectors there is a pretty big redistribution of resources and profits among firms that produce the same type of goods, but have different productivity and then can or cannot enter in the world market. Some of the main authors who highlighted these facts are Bernard and Jensen with *Exceptional Exporter Performance: Cause, Effect or Both?* and *Exporting and Productivity* (both of 1999, for U.S.), Aw, Chung and Roberts (2000, for Taiwan and South Korea manufacturers) and Pavcnik in 2002 about liberalizations in Chile. Other three more recent useful empirical works have been realized by De Loecker (2007, for Slovenia, inspecting the evolution in the industrial efficiency after the fall of the socialist government, considered as an exogenous shock to the economy), by Caliendo and Rossi-Hansberg (2012, for U.S.) and by Fariñas and Martín-Marcos (April 2003, for Spain)[56]

Our intent is neither to replicate the paper nor to rewrite all the algebraic passages of the MM, that is of course tractable but really complex and structured in an articulated way; our aim is instead to define its main innovations - through its core-assumptions - and its most important results, that influenced the international trade theory in the following years.

We have already talk of the **dynamic setting** of the model, which implies the process of entering and exiting of firms in the market, derived from the works of Hopenhayn; in these last three decades the dynamics and the optimum control have entered in a massive way in

54 See Hopenhayn, H., *Entry, Exit and Firm Dynamics in Long-run Equilibrium* and *Entry, Selection and the Value of Firms*, both edited in 1992, the former on *Econometrica* and the latter on the *Journal of Economic Dynamics and Control.*

55 Catia Montagna developed in her *Monopolistic Competition with Firm-Specific Costs* (Oxford Economic Papers, 1995) an Hopenhaynian model of monopolistic competition confined, however, to a static equilibrium without entry/exit of firms, uniform productivity level and where the present value of a firm is not included into a firm's entry-decision.

56 For all these exact references, see the final References. See also Aw, B. Y., Chung, S., and Roberts, M., *Productivity, Output and Failure: A Comparison of Taiwanese and Korean Manufacturers*, *mimeo*, July 2002. Clementi and Palazzo with their *Entry, Exit Firm Dynamics and Aggregate Fluctuations* (NBER, July 2003) showed how entry and exit of firms propagate the effects of shocks, and how a positive shock increases the number of firms and their productivity. See also Eaton, J., and Kortum, S., *Technology, Geography and Trade*, Econometrica, 2002.

economics, so this is, for the MM, an important issue but, in 2003 and with the purpose of developing a general equilibrium model, an "obvious" feature to adopt by the author.

The most relevant introduction of the MM is, instead, the **heterogeneous nature** of the industrial sector in a monopolistic competition environment.

But how did Melitz get this heterogeneity?

Heterogeneity has been reached assuming *different levels of productivity* among firms - a realistic assumption at all, but quite complex to include in a work; Melitz, however, generated a statistic of average productivity feasible for his purpose, leaving the model tractable. So, in the MM we will find firms that share the same identical thecnology, also among nations, but have different productivity.

Sunk entry-costs, both for entering in the domestic and in each of the foreign markets, are the further relevant assumption of the MM. In the MM, firms with different productivity levels can coexist in the market because each of them, *before* entering in the market, must take the entering-decision facing an initial uncertainty about its future productivity, making (or not) the sunk, irreversible investment in order to actually starting the production.

To empirically support the assumption of the existance of a sunk entry-costs also both for domestic and foreign markets an empirical work of reference has been made by Bernard and Jensen in 2001 for the U.S. and by Das, Roberts and Tybout again in 2001 for Colombia.[57] Sunk entry-costs may help to explain the high rate of survival of the exporting firms (acting as barriers to entry against new competitors) and can be also seen as the "practical" explanation of the simultaneous entry and exit of firms in a steady-state.

Once a firm has made the initial investment $\boldsymbol{f}$, then it "learns" what its real productivity is, a fact that is included in the model with a common distribution with support between $(0, \infty)$; and once a firm is into business, it faces a probability $\boldsymbol{\delta}$ to be hit by a negative shock that pushes it out of business.

All these assumptions are coherent with another strong empirical evidence: the fact that new entrants have on average lower productivity and higher probability of bankruptcy than incumbents.

In the MM, all the profits realized by the firms must be reinvested, in the same way consumers must use the entire wage without saving a fraction of it. The mass of entrants replaces in each period the mass of incumbents hit by a negative shock. Furthermore, in the MM the entrance in the market is limited by the condition that profits must refund the initial investment $\boldsymbol{f}$ so that the number of firms may be bounded since, if the net value of entry is negative, no firm would want to enter.

For our purposes, it can be interesting and useful to remind just two important results of the MM in a closed-economy *equilibrium*.

57 Bernard, A., and Jensen, J., *Why Some Firms Export*, NBER, 2001, and Das, S., Roberts, M., and Tybout, J., *Market Entry Costs, Producer Heterogeneity and Export Dynamics*, Econometrica, 2007.

The first is the number $\boldsymbol{M}$ of firms:

$$\boldsymbol{M} = \frac{\boldsymbol{L}}{\boldsymbol{\sigma}(\overline{\boldsymbol{\pi}} + \boldsymbol{f})}$$

that is proportional to the country-size $\boldsymbol{L}$ (that is also the quantity of labor available) and negatively affected by the fixed costs, the average profits $\overline{\boldsymbol{\pi}}$ and the elasticity of substitution between goods $\boldsymbol{\sigma}$, and furthermore it increases in L even if the distribution of productivity levels does *not*.

The second crucial result is the welfare $\boldsymbol{W}$ of a worker,

$$\boldsymbol{W} = \boldsymbol{\rho}\overline{\boldsymbol{\varphi}}(\boldsymbol{M})^{\frac{1}{\sigma-1}}$$

that is proportional to the degree of substitution among goods $\boldsymbol{\rho}$, the average productivity level of firms $\overline{\boldsymbol{\varphi}}$ and also increases with the dimension of the country (through M) just thanks to the increase in goods' variety, as in the Krugman model of 1980.

In general, in this model an increase in L does not affect firm-level variables, but only their number (and so the number of varieties); and the same is for the effect of the opening up to trade, that does not alter the conclusions of the MM with heterogeneous firms, in the same way of the Krugman model, were the conceptual results in closed-economy held also in the opened-economy.

Moreover, one of the final objective of the MM is to explain (or discover not be able to do it in that way, why not) if, and eventually how, international trade may affect productivity and its variations in an industry. Melitz argued that the exposition to trade embodies that exogenous shock (at the end, a positive overall shock) that forces economic agents to reallocate resources among firms, from the less productive to the most ones, generating an overall gain in aggregate productivity but also in welfare, and not only for the bigger number of varieties available but also for the overall gain in efficiency of the industrial system, as we are going to discover.

So, the MM helps to explain how a change in the general, aggregate productivity-level of the whole industry does not need changes in the technology-level, that may be the immediate, natural and obvious source of productivity changes - and this is for itself a great result - but is also a consequence of globalization.

But it is also true that, in order to export, in reality firms must face peculiar problems and fight against many practical difficulties: so the MM includes both the usual "iceberg-cost" $\boldsymbol{\tau}$ for trading and a fixed-costs $\boldsymbol{f_{ex}}$, as mentioned that a firm must bear to invest in each foreign symmetrical country.

The model considers a number of symmetrical countries in order to ensure factor price equalization among them (see further for a particular other case developed by the same Melitz in 2004 about relative wages in asymmetrical countries) and to determine the effect of trade on wages among heterogeneous firms, difference in wages that themselves generate firms-selection

and productivity-differences among countries.

The analysis of Melitz consist in long-run steady-state *equilibria*; the comparison between autarky and free-trade in the MM shows how, in a long-run *equilibrium*, trade will always bring benefits to consumers and so an aggregate gain in welfare.

The immediate cause of these overall gains, inheritance of the Krugman model, is the increase in the varieties. And as in Krugman, we cannot determine the precise direction of the trade, and the number of domestic firms replaced by foreign industries.

Typically, these replaced home-plants are less than the number of new entrants, determining an increase in total available variety of goods in a nation (but we will see in the second chapter how, in a similar framework, Baldwin and Forslid delivered the opposite conclusion, that is, an increase in the trade "degree of freedom" make the overall number of available varieties in a nation to decrease); but, even if this fact would not be true, in the MM it is demonstrated how consumers can anyway benefit of a gain in welfare from trade thanks to the fact that *relatively efficient* foreign firms replace *relatively* to them *inefficient* domestic firms, generating in this way an aggregate net welfare gain even so due to the reallocation of resources from less productive to more productive firms.

Market-shares, revenues and then profits are then reallocated from less productive firms to the more efficient ones and so society as a whole benefits of an increase in net total welfare through this gain in overall productivity of the industrial sector.

Trade, even if it may be costly to some economic agents, always generates an overall welfare gain; the role of the public regulator, once again, should be to support those who eventually lost their job because of foreign competition and help them to reallocate their competences as soon as possible in the new productive firms, in a such a simplified model with just the industrial sector; in a modern real economy, this probably means to reallocate workers in the services-sector, the one that employes the most part of the active population.

The MM in its Conclusion is clear and direct about this point: policy-makers who would try to fight against free-trade, for its possible negative short-run consequences on a small part of population, at the same time would fight against the whole society, stopping the benefits (and it is by now evident that benefits are real) of the trade for the entire economy to defend, at any costs, the static position of a sector or a group of agents, that is of course a natural and for some aspects correct behavior to assume, but not right and honest in the end.

The analytical exposition of Melitz demonstrates how, in an open-economy scenario, because of the new foreign competition in the home-market all domestic firms incur in losses in their *national* market. The solution to the (apparent) *busillis* is that national firms themselves must export their own variety in foreign countries, re-gaining those market share they have lost at home; but in the MM only better, efficient firms can do that, facing and bearing iceberg-costs and the initial sunk investment f_{ex}.

So, a firm that does not export incurs in a net revenues loss, while a firm able to export reaches new profits, even if only the best, more efficient part of the fraction of these most productive exporting firms can actually gain from export, seeing how profits will increase

together with their productivity, while a section of these exporters will only be able to cover the domestic market losses suffered because of foreign competition: the possible profits-trajectories of a firm are multiple and which a firm will follow depends only to its own relative productivity with respect foreign firms.

At this time, it can be useful to see the equation Melitz derived to define the variations in total profits in the transition from autarky to open economy:

$$\Delta\boldsymbol{\pi} = \boldsymbol{\pi} - \boldsymbol{\pi_a} = \boldsymbol{\varphi}^{\sigma-1}\boldsymbol{f}\left[\frac{\mathbf{1}+\boldsymbol{n\tau}^{\mathbf{1}-\boldsymbol{\sigma}}}{(\boldsymbol{\varphi}^*)^{\boldsymbol{\sigma}-\mathbf{1}}} - \frac{\mathbf{1}}{(\boldsymbol{\varphi}_{\boldsymbol{a}}^*)^{\boldsymbol{\sigma}-\mathbf{1}}}\right] - \boldsymbol{nf_{ex}}$$

where $\boldsymbol{\varphi}^*$ is the cut-off level of productivity, that is, the lowest possible productivity-level for producing, as $\boldsymbol{\varphi}_{\boldsymbol{a}}^*$ is the cut-off one in autarky, and from which is possible to see how the change (negative or positive) in profits is negatively affected by fixed entry-costs and the number of firms, but also the crucial role of the productivity levels.

International trade drives a selection among firms that touches the entire industry of a country, with winners and losers. **Figure 5**, taken from the original Melitz's paper, effectively represents the situation: the most efficient firms with productivity $\boldsymbol{\varphi}_{\boldsymbol{x}}^*$ can export and then get higher revenues (revenues that make a jump when the cut-off productivity φ^* faces the open-economy scenario) and profits, while autarkical firms with efficiency-level $\boldsymbol{\varphi}_{\boldsymbol{a}}^*$ obtain lower revenues and profits at the point that the least efficient within them are pushed out of the market.

In the middle, there is a bunch of firms actually able to export but not efficient enough not to loose at least a small slice of their original profits and an other group not able to export, that will loose a significant part of their revenues and profits but anyway able to resist and stay into the domestic market.

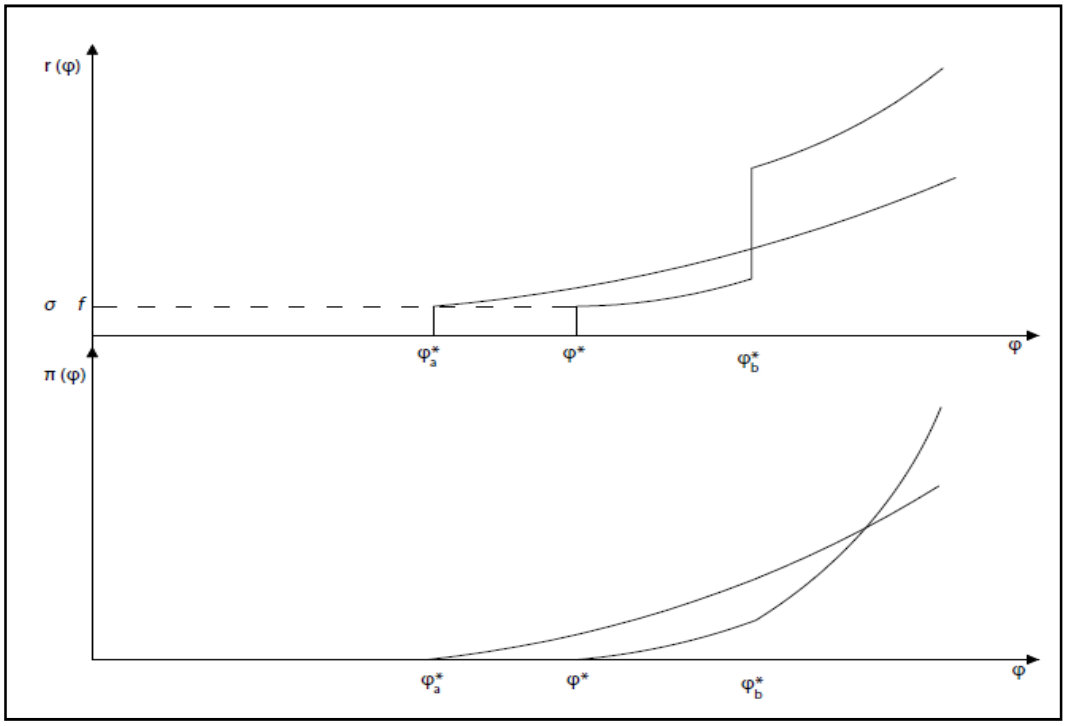

Figure 4 - Revenues and profits for autarkical ($\boldsymbol{\varphi_a^*}$) and exporting ($\boldsymbol{\varphi_x^*}$) firms in the Melitz model (2003)

It is important, actually crucial, to understand the true, real reason that drives relatively inefficient firms out of the market: it is not the increase in competition. Indeed, the CES formulation of the preferences, as we have already seen in the D-S model, is not affected by changes in prices or in the number of competitors (and this was clear also in the open-economy scenario of Krugman 1979). This is, maybe more clearly here than anywhere else, one of the possible limit of the CES utility function, if we want to find a deficiency to it.

But it is also true that this effect does exist in the MM; where can we find its source, then?

The answer, as in the Krugman model, lies in the real wages, that embodies the other reason for the higher overall welfare in an open economy: if there is just a relatively small number of firms able to operate in an international context, their entry in the market will induce other firms to bear the "international sunk-cost" f_{ex}: but this relatively small number of plants (compared to the total number of firms operating in the world economy, namely included the merely domestic ones) will make real wages grow for their workers, *ceteris paribus*, forcing less productive firms to the exit from the market.

So, once again, the model naturally "releases" - with the CES specification even if not merely thanks to it, an other great point of this class of function - the fundamental effects of the

productivity of industries on wages and trade among nations and how this commerce increases total net welfare.

The last step of the analysis of Melitz is focused on the investigation of the effects on the industry, output, productivity and on social welfare of an increase in trade-exposure (namely, an increase for a nation in the chances of participating to the international commerce) under three possible ways: an increase in the number of commercial partners, a decrease in the variable costs, or a reduction in the fixed ones (there are may example available in reality to embody those effect here listed in such "theoretical" way: new members included in a trade-agreement, reduced tariffs and other trade-barriers, lower prices of commodities...).

In the first case, increasing n gives the same effects of the previous transition from close to open economy: more international competitors may reduce some firms' revenues and profits or expel other plants from business; market shares and profits are reallocated from less productive firms to the better ones and society as a whole sees an increase in net total welfare and a gain in productivity; the incumbent most productive firms already exporters will see their market share and profits increasing.

A decrease in the variable costs has the same effects, since a lower cut-off is now lower than before, fostering exports and then the entrance of new competitors in the exporting markets in an higher number than before thanks to the lower barriers.

A lower initial sunk-cost for foreign investments has once again almost the same effects, even if this lower fixed-cost does not allow to increase market share and profits of incumbent most productive firms because only new exporters may benefit from the decrease in the starting initial fixed-cost.[58]

We will see in the second chapter how the variety effect, presented in the MM as *probable* consequences of a freer trade, is not confirmed by the paper of Baldwin and Forslid of 2010 *Trade Liberalisation with Heterogeneous Firms*, that uses the MM as conceptual basic framework.

Literature has accepted the MM as a great contribution to the economics research, and many papers have been based on the sketch of that work and extended or analyzed it, as others trailblazed it for some particular features (see the aforementioned Hopenhayn, 1992).

Bernard, Eaton, Jenson and Kortum in 2000[59] developed, for example, a model of Ricardian taste with heterogeneity among firms that have comparative advantages in different countries. This model fits some U.S. data both at micro and macro level, producing moreover an endogenous distribution of the markups because firms compete in their home for producing the same variety, a feature (the endogenous markups) that the MM has not, even if this latter provides a variable number of varieties, depending from the exposure to trade, a characteristic that the paper of Bernard *et alia* has not because it assumes as exogenously fixed the number of available varieties.

58 See Roberts, M., Sullivan, T., and Tybout, J., *Micro-Foundations of Export Booms*, *mimeo*, 1995, for empirical evidences.

59 Bernard, A., Eaton, J., Jenson, J. and Kortum, S., *Plants and Productivity in International Trade*, NBER, 2000.

A particular case extracted from the MM is the paper of Helpman, Melitz himself and Yeaple (2004) in which countries are not symmetric, but an homogeneous freely tradable good sector used as a sort of *numeraire* sector exists; in this way, then, relative wages are not endogenously relatively determined *via* trade (as if there would not be the free homogeneous good), but this approach constitutes a less general and advanced scenario than the MM, anyway useful to deal with asymmetry among countries.[60]

Simonovska and Waugh, with two papers (2011, 2014), inspected some interesting results of the MM. In their paper of 2011,[61] where they computed possible welfare gains and elasticities of a group of well-known trade models adapting them to a set of data, they found how the MM provides no substantial new advantages and gains in welfare with respect the "traditional" Armington[62] model, but its heterogeneous industrial structure allows for a better calculation of the elasticity of trade and it is in general more advanced and tractable.[63]

In their other paper of 2014,[64] Simonovska and Waugh made an interesting analysis concerning the Krugman and the Melitz models; the authors computed the trade elasticities for both models, with the result that the latter gives a lower elasticity-estimate than the former, reaching then higher gains from trade. To define this elasticity, authors had to limit their analysis for what concerns the MM only to the sufficiently productive firms that sell both at home and abroad: this in order to be able to define relative prices among countries (remembering that in the MM some goods are sold at home but not abroad). The calculations deliver as result that the MM offers an elasticity of trade about 30% lower than the KM, increasing the welfare and then the gains from trade of the same figure with respect the KM. However, the two authors underline how the KM can be considered a particular case of the MM in which firms' different productivity levels degenerate in the particular case of a uniform, homogeneous and constant productivity for all firms.

Chaney (2008)[65] exploited the concept of "**intensive**" and "**extensive**" margins in trade among countries, where the *intensive* margin is the type of commerce the KM features, in which all successful domestic firms enter in the world market selling a fraction of their variety to each consumer (that is, already existing firms increase their exports thanks to international trade), and

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60 Helpman, E., Melitz, M., and Yeaple, S., *Export Versus FDI*, American Economic Review, 2004. The same authors published also *Export Versus FDI with Heterogeneous Firms*, American Economic Review, 2004.

61 Simonovska, I., and Waugh, M., *The Elasticity of Trade: Estimates and Evidence*, CESifo, 2011.

62 The Armington Model is a trade model developed in 1969 by Paul Armington (see References): it is a basic model of international trade based on the assumption that consumers of a country have a sure demand for foreign varieties. The so-called Armington Elasticity is the elasticity of substitution between products made in different countries (see also Feenstra, R., Obstfeld, M., and Russ, K., *In Search of the Armington Elasticity*, NBER, 2012). To better understand the implications of the Armington model, see: Anderson, J., *A Theoretical Foundation for the Gravity Equation*, American Economic Review, 1979, *The Gravity Model*, Annual Review of Economics, 2011, and Anderson, J., and van Wincoop, E., *Gravity with Gravitas: A Solution to the Border Puzzle*, American Economic Review, 2003.

63 See also Bernard, A., Jensen, B., Redding, S., and Schott, P., *Firms in International Trade*, Journal of Economic Perspective, 2007.

64 Simonovska, I., and Waugh, M., *Trade Models, Trade Elasticities and the Gains from Trade*, NBER, 2014.

65 Chaney, T., *Distorted Gravity: Intensive and Extensive Margins of International Trade*, American Economic Review, 2008.

the *extensive* margin is the result of international trade given by the MM, where not all firms can sell abroad (that is, a fraction of the industry, embodied by new, higher-performing firms, starts exporting in the moment in which *costly* international trade is allowed). The analysis of Chaney focuses on barriers to trade and the elasticity of trade facing those obstacle; if these barriers are not so strong, the extensive margin prevails (the firms' productivity distribution is a Pareto distribution), and *viceversa*.

Finally, Helpman *et alia* (2010)[66] merged the MM with an analysis of the labor-market, showing how international trade may first increase than decrease wage differentials, in particular if fostered by trade liberalization.

As highlined by the quoted papers of Simonovska and Waugh (2011 and 2014), Chaney (2008), Eaton, Kortum and Kramarz (2011),[67] Arkolakis (2011)[68] and many others we have (quickly) seen or not, the MM has the great advantage to be flexible and tractable, even if it is not so easy to deal with it, and a lot of feasible extensions and modifications of its basic framework are able to capture many of the features of modern international trade flows in the context of a growing globalization that is involving all the countries in the world.

Baldwin and Harrigan (2007)[69] underlined some empirical limits of the KM and of the MM, offering a modified MM (on the line of Helpman, Melitz and Yeaple 2002) to better fitting empirical data, but with the loss in generalization due to particular approaches like their one; the same Baldwin (2005)[70] successfully employed the MM to underline some empirical results similar to the ones offered by the Stolper-Samuelson Theorem.[71]

Arkolakis *et alia* (2008) showed how, given data on international trade-flows, the last trade models (*e.g.*: Chaney 2008, Baldwin and Forslid 2004...) derived from the MM substantially reach no more gains from international trade than this latter one.[72] Melitz and Redding (2014)[73] again

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66 Helpman, E., Itskhoki, O., and Redding, S., *Inequality and Unemployment in a Global Economy*, Ecometrica, 2010. See also their *Trade and Inequality: From Theory to Estimation*, NBER, 2012.

67 Eaton, J., Kortum, S., and Kramarz, F., *Dissecting Trade: Firms, Industries and Export Destinations*, American Economic Review, 2004.

68 Arkolakis, C., *Market Penetration Costs and the New Consumers Margin in International Trade*, Journal of Political Economy, 2010.

69 Baldwin, R., and Harrigan, J., *Zeros, Quality and Space: Trade Theory and Trade Evidence*, American Economic Journal: Microeconomics, 2011.

70 Baldwin, R., *Heterogeneous Firms and Trade: Testable and Untestable Properties of the Melitz Model*, NBER, 2005.

71 The Stolper-Samuelson Theorem, closely linked to the Heckscher-Ohlin Theorem, has been developed by Paul Samuelson and Wolfgang Stolper in 1941 and states that, in a two-factors/products world, an increase in the relative price of a good leads to an increase in the real wage in the factor used relatively intensely in the production of that good.

72 Arkolakis, C., Demidova, S., Klenow, P., and Rodríguez-Clare, A., *Endogenous Variety and the Gains from Trade*, NBER, 2008, and Baldwin, R., and Forslid, R., *Trade Liberalization with Heterogeneous Firms*, Review of Development Economics, 2010. See also note 71.

73 Melitz, M., and Redding, S., *New Trade Models, New Welfare Implications*, NBER, 2014.

supported the value of the modern "heterogeneous" models of trade versus the non-homogeneous ones that reach lower welfare gains, as did Arkolakis *cum alia* (2011)[74] who studied again the impact and the real addictions given to recent trade models, reaching once again the conclusion that after the MM research did not obtained very relevant and innovative results in the effort of explaining and describing international trade flows.

Nowadays - The Pricing-to-Market and Home-Market Effects

The more recent innovations and contributions in the international trade theory are all long-run consequences of the great innovations of the MM.

Melitz and Ottaviano (2008),[75] for example, extended the MM with a linear demand that delivers the same overall results of the MM demonstrating once again how relatively open, free, integrated and larger markets foster the productivity and show lower markups.

But it is also true that international trade is characterized by many specific matters and inconclusive questions that go beyond the mere specifications of Melitz or Krugman or anyone else's papers, because it is clear that trying to resume all possible features that trade among nations exhibits it a really hard task - as it is trying to offer a completely exhaustive literature-review on this theme; but for sure it is possible to define some more important ranges of interest involving international trade (with the monopolistic competition at its side).

The so-called "**pricing-to-market**" (**PTM**) *phenomenon* is one of these interesting tasks; broadly speaking, it means that markups should be higher in higher-income countries. This means that income should directly perform a relevant role in determining differences in prices among countries with different price-levels. The PTM effect is consistently recognized in the empirical literature, for example with two recent contribution by Alessandria and Kaboski (2011) and Simonovska (2013), where prices seem to be positively correlated with income and not with the size of the population of a country.[76]

The first relevant paper that analyzes the pricing-to-market effect in a theoretical sense is another of the main Krugman's work, published in 1986;[77] in this paper the effects on the supply

74 Arkolakis, C., Costinot, A., and Rodríguez-Clare, A., *New Trade Models, Same Old Gains?*, American Economic Review 2012.

75 Melitz, M., and Ottaviano, G., *Market Size, Trade and Productivity*, Review of Economic Studies, 2008.

76 Alessandria, G., and Kaboski, J., *Pricing-to-Market and the Failure of the Absolute PPP*, American Economic Journal, 2011, and Simonovska, I., *Income Differences and Prices of Tradables*, University of California - Davis W. P., 2013.

77 Krugman, P., *Pricing to Market when the Exchange Rate Changes*, NBER, 1986.

among countries (with focus on U.S.), the role of the quick price adjustments in different countries and the importance of firms-reputation when a change in the exchange rate occurs are investigated, starting from the neat empirical evidence (even if, as the same Krugman underlines, in those years there was a lack in quantity and quality of data) of the PTM phenomenon. As basic general justification for the PTM, Krugman assumed that richer countries have a more rigid demand.

A really recent contribution has been given by Bertoletti and Etro (2013)[78] in a paper on which the two authors, using the basic international trade framework developed in the KM, include different income levels for different countries. With no transport costs, markups are higher the higher is the *per capita* income if the elasticity of substitution is decreasing in consumption. Also Simonovska (2013, see note 76) dealt with prices' increasing in income with heterogeneous firms but in the three special cases of hierarchic-demand class (developed by Jackson in 1984),[79] the CARA utility (constant average risk aversion) that we will see later (see note 85) and the linear demand used in Ottaviano and Melitz (2008, see note 75).

The same two authors, in an other their paper of late 2013,[80] assume that consumers' preferences are represented by an additively separable *indirect* utility function, so that the elasticity of substitution between two goods depends on income (unless preferences are homothetic, clearly) and not on prices or quantities of those goods.[81] The final results of their paper are that the PTM effect emerges for richer countries - that must have a more rigid demand as assumed originally by Krugman (1986) - when the elasticity of demand increases, and that the KM with transport costs, as extended by the authors assuming different income levels for the two involved countries, has higher markups for *exports* with lower transport costs; but the model also shows how, under the assumption of different income-levels for different countries, the opening-up to trade may also lead to a process of business destruction in both countries, reaching then to an increase in welfare thanks to a general reduction in markups. The overall effect depends then on the value of the elasticity of demand. With no transport costs, the model shows how in richer countries - with higher *per capita* income - a process of industrial concentration in fewer and bigger firms may rise, supporting then also the so-called "home-market effect" that we are going to discover in a while. The results of the costly international commerce case are in line with the Linder Hypothesis and with the recent investigation of Fieler (2011) too.[82]

Markusen (2013)[83] tried to give an answer to the empirical evidence in favor of price-gaps

78 Bertoletti, P., and Etro, F., *Pricing to Market in the Krugman Model*, Economic Bulletin, 2014.

79 Jackson, L., *Hierarchic Demand and the Engel Curve for Variety*, Review of Economics and Statistics, 1984.

80 Bertoletti, P., and Etro, F., *Monopolistic Competition when Income Matters*, University of Pavia DEM Working Papers, 2013.

81 In the usual CES case of the D-S model, that assumes a *direct* utility function, is the *marginal rate of substitution*, and not the elasticity of that rate, not to be affected by consumption or prices of other goods. See also Blackorby, C., Primont, D., and Russell, R., *Duality, Separability and Functional Structure: Theory and Economic Applications*, North Holland, Amsterdam 1978, Hicks, J., *Direct and Indirect Additivity*, Econometrica, 1969, and Samuelson, P., *Corrected Formulation of Direct and Indirect Additivity*, Econometrica, 1969.

82 Fieler, A. C., *Nonhomotheticity and Bilateral Trade: Evidence and a Quantitative Explanation*, Econometrica, 2011.

83 Markusen, J., *Putting Per-Capita Income Back Into Trade Theory*, Journal of International Economics, 2013.

among countries through a non-homothetic approach, confirming indirectly once again the crucial role of the imperfect competition in the international trade theory in order to explain peculiar effect such the PTM and giving a new alley to the Linder Hypothesis, that also in the Markusen's paper finds an overall positive answer.

An important recent contribution by Zhelobodko, Thisse *et alia* has been published in late 2012:[84] in that work, for many technical aspects already anticipated by a work of Bertoletti and Epifani at the half of 2012,[85] the authors try to go beyond the "special", steadily-elastic CES framework developing a more general model of monopolistic competition that includes firm entry and exit and the impact of the market size on firms.

The tool that authors used to achieve their purpose is the concept of "**relative love for variety**" (**RLV**, $\boldsymbol{r_u(x)}$, where u is the utility from the consumption of a good and x is that consumption), that is the *elasticity of the marginal utility* and - when consumption is the same across varieties - *the inverse of the elasticity of substitution* $\boldsymbol{\varepsilon_x(p)}$ among goods:

$$\boldsymbol{r_u(x)} \equiv -\frac{\boldsymbol{x * u''(x)}}{\boldsymbol{u'(x)}} \qquad \text{and} \qquad \frac{\boldsymbol{1}}{\boldsymbol{r_u(x)}} = -\frac{\boldsymbol{1}}{\boldsymbol{\varepsilon_p(x)}} = -\boldsymbol{\varepsilon_x(p)}$$

The utility function embodies *additively separable* preferences; this is a very restrictive assumption, even if it allows for high tractability;[86] and this approach means also - and I think this is the most important point of the paper even if achieved to a high cost - that *the elasticity of substitution is variable*, meaning moreover that RLV varies with the consumption level, and the actual value of the elasticity of substitution is determined by the market outcome depending on the RLV behavior.

In fact, authors showed how the RLV determines the market outcome with different results: if the RLV increases with consumption, prices diminish thanks to an higher number of firms and/or a larger market size because of the elasticity of substitution decrease; when the RLV decreases with consumption, prices increase for the same reasons (that are, number of firms and market size which increase) because the elasticity of substitution is decreasing; so when preference has a RLV that increases in consumption, consumers face less differentiated varieties when they consume more, and they care less about variety when they relatively consume less. The

84 Zhelobodko, E., *et alia*, *Monopolistic Competition: Beyond the Constant Elasticity of Substitution*, Econometrica, November 2012.

85 Bertoletti, P., and Epifani, P., *Monopolistic Competition: CES Redux?*, Journal of International Economics, 2014.

86 Strong separability or additive separability makes a utility function really tractable, but at some costs: broadly speaking, goods must be all substitutes (not a problem in our theoretical case), no inferior goods are allowed (a quite logical consequence of the first lack) and then income must be divided within all goods, leading to the fact that if varieties constitute a large figure then each of them will have a budget-share close to zero and the single-good price elasticity will be a fixed proportion of the income elasticity. For such reasons, additively separable preferences are practical but have no actual real validation. Moreover, additive preferences when utility $u(0) = 0$ are also homothetic (under some acceptable assumptions).

concept of RLV has furthermore the good point that it does not need to be necessarily monotone and then it may vary in opposite directions with consumption, *ceteris paribus*.

Authors stressed the point of the rational decision of the consumer for his consumption, underline how love-for-variety means that consumers are willing to exchange lower overall consumption against higher variability in their residual consumption, and how their decision-making process can be considered the equivalent to the one in the Arrow-Pratt risk-aversion theory, with a mix of risky assets (few-varieties - concentrated-on consumption) replaced by a set of many differentiated assets (many differentiated varieties).

So, authors finally stated how their formulation (and their ultimate conception and application) of the concept of the RLV is able to embody this theory of risk-approach - in this case, risk-aversion: under the CARA assumption (*constant average risk aversion*) the *RLV increases with consumption*,[87] while with the classical CES formulation is constant (and equal to $1 - \rho$).

In fact, the assumptions of the utility-function applied confirm this fact: its concavity means that consumers are variety-lovers and then that they prefer to spread their consumption among a relatively large number of varieties.

On the firms-side of the problem, the model shows that the markup, maybe the core-matter of the paper, is actually equal to the RLV, and so it varies with the consumption: *when the RLV increases, the higher consumption leads to an higher markups*. The concept of love-for-variety must then be seen with a different shade for what concerns firms: here comes out that, for firms, the elasticity of revenues is equal to the elasticity of industrial bear costs, since firms care about demand - instead of caring about utility like consumers do. In this framework, welfare increases with the RLV because it is associated to higher *per capita* consumption and then to an increase in the number of varieties and so to an higher utility.

The elastic and consumption-varying elasticity of substitution among goods, that can be used interchangeably with the RLV and the price-elasticity of demand of a variety, is, in my opinion, the most important contribution - and a relevant contribution, at least in a view of "right-way approach" - of this paper to the monopolistic competition theory, valuable to being applied in the international trade context too.

However, Bertoletti and Epifani in their paper (see note 85) seem to critique some aspect of a departure from the CES framework because this may lead to counter-intuitive or also opposite to robust logical or empirical results.

More recently, Fajgelbaum, Grossman and Helpman (2011)[88] tried a new approach to the matter in order to explain not only exports of goods and commodities, but also capital assets and the spurce and the motivation of foreign direct investments (FDI) in general with a monopolistically competitive market; the result is that differences in income among countries may be able to explain those movements of goods and capital.

In particular, capital flows occur between similar - for size and income - countries, confirming

87 See Beherens, K., and Murata, Y., *General Equilibrium Models of Monopolistic Competition: A New Approach*, Journal of Economic Theory, 2007.

88 Fajgelbaum, P., Grossman, G., and Helpman, E., *A Linder Hypothesis for Foreign Direct Investment*, NBER, 2011.

also for the FDI the Linder Hypothesis. This result can explain some empirical evidences and it is of course correct, within the limits of its hypotheses, but in my opinion is not complete, because it seems to be in contrast with the FDI that flow from advanced western countries to the developing ones in the last thirty years about (think about South Korea, Thailand, Argentina, Brazil and of course China, that are often really different for size and/or income level from Japan, U.S. and EU members), whose growth has not been fostered by national savings only but also or in particular by massive foreign investments and technology imports made by overseas investors.

We have already talk a little about the **home-market effect** (**HME**), that is another "branch" of research of international trade studies developed mainly in the last fifteen years about.

Since we have already given an introduction about it in the section spent for Paul Krugman in this chapter, here just an essential list of some of the main papers of the last years about the HME is offered, papers whose results are not always fully coherent and they strongly depend on their own specific assumptions, but that overall confirm the existence of such effect; and as we have seen with the Krugman model, the HME can be quite easily modeled in a context of a monopolistically competitive market structure. We will see in the second chapter how the HME emerges very clearly also in a context similar to the one of the MM but where the opening up to a freer trade reduces the number of available varieties since foreign, more efficient firms eliminate the competition of less efficient national ones: it is the case delivered by the already quoted (see note 72) paper by Baldwin and Forslid (2010).

Empirically speaking,[89] Head *et alia* (2001) showed that, from a panel of U.S. and Canada firms, an increasing returns model actually is able to predict the HME, even if in perfect competition; in contrast, a constant returns model with national product differentiation predicts *reverse* HME, as found by the same Head *cum alia* (2002) in a model with a Cournotian oligopoly, in which however the effect is attributed to nations and not to firms (see note 51).

Behrens *et alia* (2005) further applied this theory to a cross-section of OECD and non-OECD countries, following the "Davis-Weinstein Conjecture"[90] to extend also empirically the Krugman-model concept to a worldwide scenario, and their main finding strongly backs the HME prediction, especially between OECD countries.

Hanson and Xiang (2002) found that, using a difference-in-difference gravity approach, HME exists when relatively large countries has sufficiently large exports with relatively high transportation costs and scale economies: HME effect is stronger for bigger countries, it has a regional influence for medium nations and so, finally, the impact of free-trade replacing trade-barriers may be not so strong, depending on the trade-pattern of a country (but, clearly, the richer the country, the more differentiated should be its commerce so the impact of trade liberalization should be greater).

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89 For a neater exposition, all the details about the quoted papers in what follows can be found in the final References.

90 Davis and Weinstein (2003) argued that, with many countries involved, firms are located unproportionately depending on an index considering local demand (Linder Hyp.) and foreign demand.

Huang and Huang (2007), using the U.S. patent stock of 2002 for six industries, found that the higher the technological intensity of an industry, the higher the effect of the technology-advantage to offset HME and more likely to reverse the HME, and also that, even if the HME should act against smaller countries, if a small nation has a sufficiently small gap in technology the effect vanishes and, moreover, if it has a sufficiently large advantage in technology it can obtain its share of global market although its reduced - in dimension - industry, as also the same Huang *et alia* (2006) had derived theoretically.

The important contribution of Davis (1998) showed that, if homogeneous and differentiated goods face identical transport costs, then the HME disappears, as obtained by Behrens (2005), who demonstrated that the HME may vanish when non-traded goods are involve.

Yu (2005) showed that if the consumer's preferences follow the form of a CES between the homogeneous and differentiated goods, then the reverse home-market effect may occur, depending on the level of elasticity. More specifically, if the elasticity of substitution is less than 1, then the home market effect will reverse.[91]

As we have seen before, a sort of HME emerges also in the recent model of Bertoletti and Etro (2013, see note 80).

A last, relevant contribution to the trade theory based on the monopolistically competitive market structure is the paper of Beherens and Murata (2011),[92] whose contents had been treated also in Bertoletti (2006),[93] who like Beherens and Murata applied negative exponential preference; strong is also the influence of Feenstra (2003) and the previous work of 2007 of Beherens and Murata themselves.[94]

In their paper, these two authors offered a general equilibrium model not using the CES utility-function in order to obtain those "pro-competitive" effects (that is, the scale of production is not affected by the opening to trade,[95] as illustrated in the KM yet). Authors demonstrated how their model is successfully affected by those pro-competitive affects, and their framework allows

91 For other references and details on the HME, see Feenstra, R., Markusen, J., and Rose, A., *Using the Gravity Equation to Differentiate Among Alternative Theories of Trade*, Canadian Journal of Economics, 2001. As quoted reference, see also Markusen, J., and Venables, A., *Trade Policy with Increasing Returns and Imperfect Competition: Contradictory Results from Competing Assumption*, Journal of International Economics, 1988, where varieties are linked to nations (in a sort of modellization of comparative advantage) rather than firms. For a multi-country scenario and the possible role of the difference in technologies, see Behrens, Ottaviano, *et alia*, *Beyond the Home Market Effect: Market Size and Specialization in a Multi-Country World*, 2009. For a comparative advantage among international industries approach instead of increasing returns one can see Hanson, G., and Xiang, C., *The Home Market Effect and Bilateral Trade Patterns*, NBER, 2002.

92 Beherens, K., and Murata, Y., *Trade, Competition and Efficiency*, CIRPÉE, 2011 (also in Journal of International Economics, 2012).

93 Bertoletti, P., *Logarithmic Quasi-Homothetic Preferences*, Economics Letters, 2006.

94 See Feenstra, R., *A Homothetic Utility Function for Monopolistic Competition Model, Without Constant Price Elasticity*, Economic Letters, 2003, and Beherens, K., and Murata, Y., *General Equilibrium Models of Monopolistic Competition: A New Approach*, Journal of Economic Theory, 2007, where the basic framework of the paper of 2011 has been built.

95 And this means also that price should decrease with the increasing of the number of firms (and of varieties so).

to decompose the gains in welfare between the increase in the mass of firms and the resulting decrease in prices (pro-competitive effect) and the mere increase in variety; authors can also demonstrate how in autarky markups vary with the size of the country. The negative results of their complex and useful work even so are that the departure from the chance of price discrimination made with their approach is a loose in verisimilitude, and that the market outcome is not efficient as the CES one because too many firms operate at a too small scale of production.

Chapter II
The Baldwin-Forslid Model

Introduction to the Model of Baldwin and Forlsid (2010)

This second chapter is devoted to the analysis of the paper *Trade Liberalisation with Heterogeneous Firms* written by Richard Baldwin and Rikard Forslid, initially appeared for the National Bureau of Economic Research on April 2006 and then officially published in the Review of Development Economics in 2010.[96]

Trade Liberalisation with Heterogeneous Firms is based on a framework *à la* Melitz (2003) to include firms heterogeneity with the final intent of analyzing the effects of different ways to implement trade liberalization among countries, with some interesting results in particular about the number of varieties made available by a freer international trade. Such an analysis has already been made in the same paper of Melitz (2003), but through a simple exposition founded on the previous results of the model; the Baldwin-Forslid model exploits the Melitz's framework going deeper in that analysis with some slight different assumptions.

Baldwin and Forslid made both positive (that is, the analysis regarding the connections within economic agents and economic variables and to the causal links subsisting among them) and normative analysis (that is, the analysis that looks to the possible interactions among policy instruments or economic policies and the desired economic purposes) concerning two different ways to achieve a freer international trade: lower trade costs (*i.e.*: usual shipping costs) and/or lower regulatory barriers to trade (so-called normative "beach-head" costs that firms must initially

96 Richard E. Baldwin is professor at the Graduate Institute of International and Development Studies of Geneva, member of the Council of the European Economic Association and researcher for the National Bureau of Economic Research. He got his Ph.D. at the MIT in 1981 under the guide of Paul Krugman.
Rikard Forslid is professor at the Stockholm University and got his Ph.D. at the IUHEI of Geneva in 1994.

bear to obtain a market slice in a foreign country when they make their first approach in the foreign nation).

The qualitative and quantitative researches that Baldwin and Forslid used to support their work are, together with the aforementioned Melitz (2003), the ones we have already seen in the fourth and fifth paragraphs of first chapter, like Eaton and Kortum (2002), Helpman, Melitz and Yeaple (2004), Bernard, Eaton, Jensen and Schott (2007), Bernard and Jensen (1995, 1999), Eaton, Kortum and Kramarz (2004), Melitz and Ottaviano (2008) and Aw, Chung and Roberts (2000); all these papers demonstrated theoretically and/or empirically that just few firms - relatively to the whole number of plants in a nation - can act in the international trade context thanks to their relatively higher efficiency, and indirectly proved also that the new models of trade based on the Melitz (2003) - which was the first to tractably introduce firms heterogeneity in the international trade context - are, for the moment, the ones that better describe economic interactions among nations via trade.

The recent contribution of Melitz with Ottaviano (2008), that we have already met too - with its linear demand system taken from the work of Ottaviano, Tabuchi and Thisse (2002)[97] and that allows authors to include endogenous markups that are endogenously distributed across firms depending to the toughness of the competition of the market -, is the direct theoretical source of inspiration for Baldwin and Forslid, since it is focused on international trade with heterogeneous firms in a globalization scenario. However, the pro-competitive effects (the positive effect on competition that trade causes among firms thanks to the entrance in a market of new, foreign varieties) generated by Melitz and Ottaviano are in Baldwin and Forslid ignored, because these latter two authors focused their paper on the mere role of liberalization, developing for some aspects an easier model but obtaining as crucial difference with Melitz and Ottaviano that the opening to trade generates a *decrease* in the number of available varieties. This is a results that is clearly in contrast with probably all the previous theoretical results in this field.

But, perhaps more surprisingly, in Baldwin and Forslid nations can benefit of an increase in welfare due to trade liberalization anyway, although the emerging of the *anti*-variety effect (*i.e.*: the lower the barriers to trade, the lower the number of varieties *produced* but also *available* in an economy, an effect also informally called "McDonaldization"). Moreover, Baldwin and Forslid analyzed also the case of a liberalization in the beach-head costs, an aspect ignored by Melitz and Ottaviano.

In addition to the aforementioned papers that concern the globalization effects and the possible consequences of trade liberalization, other useful contributions to this scope are the empirical work of Broda and Weinstein (2004), the paper by Arkolakis, Demidova, Klenow and Rodriguez Clare (2008) and the contribution of Alessandria and Kaboski (2011), all reported within the References.

In the rest of this chapter we will closely follow the analysis of Baldwin and Forslid, integrating their exposition with more algebraic passages and a (hopefully) full comment of their logical steps and their economic conclusions; we will follow their exposition as presented in the

97 Ottaviano, G., Tabuchi, T., and Thisse, J., *Agglomeration and Trade Revisited*, International Economic Review, 2002.

publication for the NBER in 2006, that is the same then published in *Development Economics* in 2010.

The Model - Basic Assumptions

The analysis made by Baldwin an Forslid is merely focused on steady-state *equilibria* ignoring at the same time intertemporal discounting, that is not a necessary hypothesis for such a model; then, as in Melitz (2003), the intertemporal value of firms is assumed to be constant, since firms must face the constant probability $\boldsymbol{\delta}$ of a negative mortal shock, according to a stochastic Poisson process. The profits of the firms that actually produce are $\boldsymbol{\pi}$, and the present value of a firm is then given simply by $\frac{\pi}{\delta}$ since the discouting rate is zero as said.

The macroeconomic environment of the model consist then of two countries that are identical in all their features except for the size. The input labor $\boldsymbol{L}$ is assumed as the only production-factor, input used in both the two sectors of each economy:

- A Traditional sector **T**, whose output is constituted by a freely tradable homogeneous good to use as *numeraire* and whose practical role in the model we are going go to see in a while. Authors defined as "Walrasian" this sector, meaning that it is characterized by perfect competition, no trade costs and it consequently exhibits constant returns to scale;

- A Manufacturing sector **M**, a typical monopolistically competitive market *à la* Dixit-Stiglitz with usual effective iceberg - trade costs $\boldsymbol{\tau \geq 1}$. This sector is constituted by three different typology of fixed costs from two sources: the first source is the usual one due to innovation and development of a *new* variety, and generates the cost $\boldsymbol{F_i}$ expressed in units of labor, while the second source origins from the so-called "beach-heading", that is the necessity to bear some fixed costs to establish indeed a beach-head in a new market and gaining a position in that market, generating sunk costs $\boldsymbol{F_d}$ and $\boldsymbol{F_x}$ respectively for domestic and foreign markets.
  It is important to clarify right now a point: that those last two fixed costs must be seen as separate and independent, as two necessary costs for two different purposes. That is, F_x is *not* the *additional* cost (meaning that it is like a lower *extra* cost in addition to F_d) that a firm must bear to export its products using as basis its initial, basic knowledge obtained developing the same good to sell it in its domestic country; if it were the case, then the cost for entering in the foreign market would be higher for those firms that had not entered in the domestic market yet. Instead, the two

fixed costs are not linked one with the other.
Naturally, free-entry in this sector is allowed;

- Heterogeneity is assumed through firms' marginal costs. The aforementioned innovation costs F_i generates for each plant i a marginal cost denoted by the coefficient $\boldsymbol{c_i}$. This marginal cost is randomly assigned, by a density function $\boldsymbol{G[c]}$ with support bounded between 0 and c_0, to each firm just after it had made its initial commitment investing F_i, in the same way for Melitz (2003) the productivity parameter φ was assigned to the firms in the moment they started their business.
  For the moment, our density function will be a generic one; later, we will formalize this density function assuming that it follows a Pareto probability distribution.
  Then, thanks to this random-assignment process, Baldwin and Forslid adopted the practical solution of grouping firms into three categories: N, D, or X-firms. **N-firms** (Non-producers) are those whose marginal costs c_j are too high to make production process profitable, and then they will not sink F_i stopping just at the beginning their production; **D-firms** (Domestic-producers), instead, are those whose marginal costs are low enough to allow successful business, but not so low to permit export, too; so they will produce for the domestic market only, without entering in the international trade. **X-firms** (EXporting-producers), finally, are those firms with the lowest marginal costs, so their relatively high efficiency allows them to sell their varieties both in the domestic and in the foreign market.

This framework, with two countries that have the same and unique production-factor and two different productive sectors (a sort of "$2 \times 1 \times 2$" model of international trade), is one of the possible theoretical basis elaborated by the research with the march of the time.

In particular, the peculiar hypothesis of a sector, embodied here by the T-sector, producing a freely traded homogeneous good - that it may seem to depart from the conventional and effective monopolistic competition framework - is a feature originally adopted by Helpman, Melitz and Yeaple (2004, see Chapter I for details).

This crucial assumption allows authors to avoid relative changes in wages among sectors and/or countries and so it gives the chance to exploit it as a natural *numeraire* good in the model: the pure Walrasian connotation of the T-sector means then that wages in the two nations must be the same the ensure the *equilibrium* within sectors and among countries. So, the price $\boldsymbol{p_T}$ of the homogeneous T-good can be set as $p_T = 1 = w = w^*$ (were as usual the apex * stands for "foreign") to embody our *numeraire* for prices of goods and labor.

The particular utility-function chosen by Baldwin and Forslid is made by a combination of a first, upper stage constituted by a versatile Cobb-Douglas specification and a second tier embodied by a CES function, obtaining then a nested (or, in this case, two-tiers) utility-function.

The chosen Cobb-Douglas specification set as initial step allows a consumer to divide his expenditure $\boldsymbol{E}$ (that is exogenously given in this model) among the two M- and T-sectors;

moreover, the high tractability of this type of function easily permits to take the logarithmic form and to deal with it.

The second tier, in our case based on a CES utility-function, allows consumers to spread their preferences among the M-sector's available varieties, then following the typical and effective monopolistically competitive way of formulation of a utility-function facing heterogeneous goods.

The utility-function chosen by the authors is then specified as a log-difference between the income $\boldsymbol{E}$ and the price-index $\boldsymbol{P}$, delivering then an *indirect* utility-function:

$$\boldsymbol{U} = \ln(\boldsymbol{E}) - \ln(\boldsymbol{P}) = \ln\left(\frac{\boldsymbol{E}}{\boldsymbol{P}}\right)$$

where

(I) $$\boldsymbol{P} \equiv (\boldsymbol{p_T})^{1-\mu} \left(\int_{i\in\theta} (\boldsymbol{p_i}^{1-\sigma})\ \boldsymbol{di}\right)^{\mu/(1-\sigma)}$$

and where $\boldsymbol{p_i}$ is the price of the variety *i* of the heterogeneous M-sector among all the possible consumed varieties of the set $\boldsymbol{\theta}$, $0 \leq \boldsymbol{\mu} \leq 1$ is the Cobb-Douglas parameter that expresses the allocation of income on the M-sector (consequently, the allocation on the T-sector is $1 - \mu$) and $\boldsymbol{\sigma} > 1$ is the CES parameter regarding the allocation of the μ - consumption-share among all the possible *i* varieties.

However, the solution of adopting a two-stage utility-function utility-function, that usually allows to exploit limiting cases of the generalized specifications and to rigorously compute them, is not so frequent in the economic literature: the few available examples of nested CES and Cobb-Douglas are concentrated in these last years of research and namely are Alanson and Montagna (2005), Arkolakis and Muendler (2011) and Shimomura and Thisse (2012); and even fewer are the more particular cases of a nested logit utility-function, with Anderson and de Palma (2006), and a nested linear-quadratic utility-function, given by Eckel and Neary (2010).

The *Equilibrium*

Given our assumptions on consumers' utility and industrial organization of the two economies, we can now look at the behavior of the firms in this environment, develping the

model in order to get an *equilibrium* from which then we can easily analyze the effects of liberalizations on the two our worldwide economies.

Focusing on the M-sector, the one of interest for our purposes, is quite easy to derive the usual CES demand function faced by each monopolistically competitive firm *à la* Dixit-Stiglitz for the total consumption $\boldsymbol{x_i}$ of its own variety in the particular framework of Baldwin and Forslid:[98]

(II) $$\boldsymbol{p_i x_i = \mu E \frac{p_i^{(1-\sigma)}}{\omega(\sigma-2)} (\sigma - 1)}$$

where μE is the total expenditure among all differentiated manufacturing goods.

The term

$$\boldsymbol{\frac{(\sigma-1)}{(\sigma-2)} = m}$$

is the constant **markup** of each monopolistically competitive firm.

In fact, through firm's profit maximization we can see that in this context the **price** $\boldsymbol{p}$ of each differentiated good *i* is:

$$\boldsymbol{p_i = c_i\left[\frac{(\sigma-1)}{(\sigma-2)}\right]}$$

that is, the marginal costs $\boldsymbol{c}$ increased by the constant markup given by the monopolistically power of each diversificated good.

The denominator $\boldsymbol{\omega}$ of the demand function in (**II**), written together with the markup, is:

(III) $$\boldsymbol{\omega = \left\{n \int_0^{c_d} (c^{1-\sigma})\ dG[c|c_d] + n^* \tau^{1-\sigma} \int_0^{c_x} (c^{1-\sigma})\ dG[c|c_d]\right\} (m)^{(1-\sigma)}}$$

where $\boldsymbol{c_d}$ and $\boldsymbol{c_x}$ are the cut-off marginal costs for entering in the domestic and in the export markets respectively, and $\tau^{1-\sigma} = \boldsymbol{\phi}$ is the "**degree of freedom**" of trade, that is the level of iceberg - trade-costs that must be bear in order to export. Anticipating a close result, we can

98 We can write the demand function of consumption x_i for a variety $i\epsilon\theta$ in the way given by Dixit and Stiglitz:

$$p_i x_i = \mu E (p_i)^{1-\sigma} / \int (p_i{}^{1-\sigma})\ di$$

Since markup $\frac{(\sigma-1)}{(\sigma-2)}$ is constant and identical for all firms (feature sometimes referred to as "mill-price"), multiplying both sides by p_i and then rearranging we can get the expression (II), where in the integral has been split among its the domestic and the foreign components and where marginal costs are taken into account instead of prices.

however already state that this trade-freeness parameter's dominion must be $0 \leq \phi \equiv \tau^{1-\sigma} \leq 1$, where 0 (zero) means perfectly closed trade (so $\tau = \infty$) and 1 a totally free trade (then $\tau = 1$).

Then, ω is a sort of weighted average of the marginal costs of all those firms able to sell their product in the market. This formula is divided into two integrals: the first one for the mass of enough efficient plants to stay in the local market, that are the D-types, and the second one for imported variety since their plants have at least the cut-off efficiency; the "weighting system" of the formula is then given by the presence of this classification among national and foreign goods (whose figures are embodied respectively by n and n^*) and by the conditional cumulative density function $\boldsymbol{G[c|c_d]}$ that tells us how, in order to produce, marginal costs must be conditioned to the fact that they must be lower than c_d; for imported varieties, instead, marginal costs must lie between zero and c_x (see Melitz (2003) for the proof of how this is the right conditional density for an *equilibrium*).

So, marginal costs of a firm depends, through ω , by its competitors' efficiency.

The simplified scenario proposed by Baldwin and Forslid takes as exogenously given, unlike Melitz (2003), the distribution of the marginal costs (the efficiency level of a firm, so) among plants and the number of firms itself.

The profits of each active firm are given by the proportionality factor $\frac{1}{\sigma}$ times the sales's value. This fact then leads to a formulation of profits that in this model can be expressed as: [99]

$$\boldsymbol{\pi_d} = \frac{\boldsymbol{s[c]E}}{\boldsymbol{\sigma}}, \qquad \boldsymbol{\pi_x} = \frac{\boldsymbol{\tau s[c]E}}{\boldsymbol{\sigma}}, \qquad \text{with} \qquad \boldsymbol{s[c]} \equiv \frac{\boldsymbol{p_i}^{\boldsymbol{1-\sigma}}}{\boldsymbol{n\omega}}$$

where $\boldsymbol{s[c]}$ is, at the end of the day, the standard Dixit-Stiglitz **market-share** function including ω.

The **cut-off conditions** that a national plant must bear to stay into business in the local and in the foreign markets are:

$$\textbf{(IV)} \qquad \frac{\boldsymbol{\mu E}}{\boldsymbol{\omega}}(\boldsymbol{c_d})^{\boldsymbol{1-\sigma}} = \boldsymbol{f_d}, \qquad \phi\frac{\boldsymbol{\mu E}}{\boldsymbol{\omega}}(\boldsymbol{c_x})^{\boldsymbol{1-\sigma}} = \boldsymbol{f_x}$$

with $\boldsymbol{f_d} = \boldsymbol{\sigma\delta F_d}$ and $\boldsymbol{f_x} = \boldsymbol{\sigma\delta F_x}$ to make notation easier.

It should be clear that from (**IV**) directly follows that firms established in different nations must face the same cut-off conditions with the same marginal costs, since fixed and trade costs and the distribution of marginal costs themselves are the same in both countries; so, $c_d = c_d^*$ and

99 We know that a typical Dixit-Stiglitz first-order condition for firms can be written as $p - \frac{p}{\sigma} = wa$; rearranging and multiplying both sides by consumption x we get $(p - wa)x = \frac{px}{\sigma}$, that is, profits are proportional to revenues with proportionality-factor $1/\sigma$.

$c_{dx} = c_x^*$ (in fact, thanks to free-entry, profits are the same for each worldwide plant in its market in *equilibrium* because each firm faces the same microeconomic context in the two countries; see Helpman-Melitz-Yeaple (2003) for a proof).

Since empirical evidences, as we have seen in the first chapter, have strongly established that just a small fraction of all operating firms are able to operate in the world market exporting their product, we must harmonize our assumptions with this fact: so this firstly means that $c_x < c_d$, to which then follows that:

$$\frac{c_x}{c_d} < 1 \quad \Leftrightarrow \quad \frac{\left(f_x/_{\phi}\right)}{f_d} > 1$$

The **free-entry condition** implies that the value (remembering that here discounting is not considered) of its *ex ante*, "expected"[100] profits of developing a new variety must equal the innovation fixed cost F_i, since investors act ignoring the random efficiency-level c_i that will become known after the financial commitment of the fixed investment:

$$\textbf{(V)} \qquad \boldsymbol{f_i = \sigma\delta\left\{\int_0^{c_d}\left(c^{1-\sigma\frac{\mu E}{\omega}} - f_d\right)\, dG[c] \;+\; \int_0^{c_x} \phi c^{1-\sigma\frac{\mu E}{\omega}} - f_x \;\, dG[c]\right\}}$$

From this expression, is clear that the values of the national (first integral) and export (second integral) sales, both net of fixed costs and given the conditional probability of the future efficiency level, must be equal to the fixed innovation-cost.

The free-entry condition is the same for any worldwide plant for the same reasons expressed for the cut-off condition: investment-costs and marginal, randomly-assigned costs are the same in both countries.

But we can make an other consideration about the free-entry condition and its implications on the future profits of a firm: each active firm with marginal costs lower than exactly c_d (the marginal costs of those plants that will sell only in their domestic country) will be able to earn profits for its entire economic life, until it will be eventually hit by the negative shock δ.

The free-entry condition states, in fact, that profits must be strictly equal, not *at least* equal, to the starting investment; so the discriminant to establish if a firm will get pure profits are the marginal costs c_d, since fixed ones are the same for any plant: if a firm's efficiency-level is lower than c_d, it will not produce (N-type), if it is actually c_d, it will produce only for local demand earning no profits (D-type), and finally if it is higher the firm will export (if it is able to sink exporting fixed-costs) and also gain pure profits *at least* in its domestic market.

In the long run this process may not be true since free-entry may act as the usual force that drives profits to zero; in fact, it must be noticed that:

100 The word "expected" here is clearly not used as in the probabilistic field: it is not a mere, technical "Expectation".

$$\overline{\boldsymbol{F}} \equiv \boldsymbol{F_d} + \frac{\boldsymbol{G[c_x]F_x}}{\boldsymbol{G[c_d]}} + \frac{\boldsymbol{F_i}}{\boldsymbol{G[c_d]}}$$

where $\overline{\boldsymbol{F}}$ is the average (expected) fixed-cost for a successful variety (not a N-type - plant, so). This average cost decomposition tells us that each starting successful investment can be see as the sum of the minimum, common, domestic fixed-costs, plus the fixed-cost F_x times the conditional probability of being an exporter, plus the investment for innovation indeed.

All profits, at the end of the day, are spent for the creation of knowledge-capital in the forms of the sunk cost for innovation, and labor income is spent for the production of the consumption goods.[101]

In order to obtain explicit solutions, it is now necessary to define a precise density function for our model's marginal costs, choice embodied by the Pareto distribution frequently used in theoretical works; we then state that:

$$\boldsymbol{G[c] \sim Pareto\ (c_o, k)}$$

and so the marginal costs density function $G[c]$ becomes:

$$\boldsymbol{G[c]} = \left(\frac{c}{c_0}\right)^{\boldsymbol{k}} \qquad \text{or} \qquad \boldsymbol{G[c]} = \boldsymbol{k}\left(\frac{c^{\boldsymbol{k-1}}}{c_0^{\boldsymbol{k}}}\right)$$

with $0 \leq c \leq c_0 \equiv 1$ and where $\boldsymbol{k} > 0$ is the shape and c_0 the scale parameter of the distribution, respectively.[102] It is also possible to normalize c_0 to unity without loss of generality; in this way we can rewrite our function as:

$$\boldsymbol{G[c] = c^k}.$$

The shape parameter k will have a crucial role in our analysis, as we are going to see, because in the Pareto it describes the "degree of concentration" of the distribution: the smaller it is (*i.e.:* the closest it is to zero), the heavier will be the tail of the distribution (*i.e.:* the proportion of firms with a relatively high efficiency). This means that an *higher* k will *reduce* the number of relatively

101 Of course different plants with different productivities may benefit profits or suffer losses, depending on their particular efficiency. So, relatively most efficient firms realize for sure pure profits, while relatively more inefficient ones will face certain losses. *On average*, then, the profits of the *mean* plant are zero.

102 The fractal nature of the Pareto distribution implies that any its lower tail is a Pareto distribution itself, with the same shape but different scale parameter.

efficient, and consequently exporting, firms. The selection of its value, so, may heavily influence the outcomes of the model.

The choice of the Pareto distribution as model for firms' productivity is discussed in Chapter III; here is sufficient to remember that its use has received through the years a good empirical confirmation and that it has been originally applied in a theoretical paper in the already quoted paper of Helpman, Melitz and Yeaple (2004) in the context of FDI and by Chaney (2008) in a context of international trade.

Moreover, we can state that, in such a discountingless environment, all labor is spent for the income of the population, and so $E = L$ (and then, as previously said, total expenditure for M-sector is $E = \mu L$; see Melitz (2003) for a proof); for the same reason, it is also true that $E = \bar{F} n \sigma$.

As first consequence of these clarifications, we can derive a more precise equation for the "weighted-average marginal costs" ω, net of the markup, given the cut-off conditions:

(VI) $$\boldsymbol{\omega} = \frac{c_d^{1-\sigma}(1+\Omega)}{1-\left(\frac{1}{\beta}\right)},$$

where

$$\mathbf{0} \leq \boldsymbol{\Omega} \equiv \boldsymbol{\phi}^{\beta} \boldsymbol{T}^{1-\beta} \leq \mathbf{1} \qquad \text{and} \qquad \boldsymbol{T} \equiv \frac{F_x}{F_d} > 1,$$

and with $\boldsymbol{\beta} \equiv \frac{k}{\sigma-1} > 1$ as necessary regularity condition so that integrals computed in marginal costs of (III) converge to a finite figure.[103]

The parameter $\boldsymbol{\Omega}$ summarizes the impact of iceberg-trade costs and beach-head costs, that are the two different ways by which trade barriers can materialize in this model.

It than embodies an overall measure for trade openness and, as we will see, his role will be really important inside our framework to understand the impact of trade liberalizations; so, it is worth to underline its main features already here:

- It embodies the overall synthetic measure that expresses the protective effects of trade costs (fixed-costs of exporting and beach-head costs);
- $\Omega = 0$ when $\tau \vee \frac{F_x}{F_d}$ are infinite;

103 Equation (VI) can be obtain directly from the combination of (III) plugged into (IV) and of the Pareto distribution:

$$\omega = \left(\frac{k}{1-\sigma+k}\right)(c_d^{1-\sigma})\left[1 + \phi\left(\frac{c_x}{c_d}\right)^{1-\sigma+k}\right]$$

Substituting for β and Ω one can have the equation (VI).

- ❖ $\Omega = 1$ when $\tau = 0 \wedge F_x = F_d$;

- ❖ We can rewrite our parameter of interest also as $\Omega = \phi\left(\frac{F_x}{\phi F_d}\right)^{1-\beta}$ by which is clear that, through the condition $\frac{(f_x/\phi)}{f_d} > 1$ previously expressed, that $\mathbf{0} \leq \Omega \leq 1$.

One of the peculiar and positive results of the Baldwin and Forslid's paper - obtained in Melitz model yet, a fact that differentiates these two models from the standard Dixit-Stiglitz trade-specifications - is that not all the varieties produced in a country are exported, and then not all the possible goods are consumed by all the worldwide consumers, because of there are firms' efficiency-levels that are not sufficiently high to allows for exports.

Using the cut-off conditions, the free-entry condition and exploiting the last formulations for $G[c]$ and ω we can firstly derive the **number of active firms** in each economy (that is, the number of varieties produced, obviously):[104]

(VII) $$\boldsymbol{n = \frac{(L-\Omega L^*)\mu(\beta-1)}{(1-\Omega^2)\beta f_d}}$$

where, to get the foreign specification, it is sufficient to invert the symbol * for the masses of consumers L; correctly, this number of plants is positively affected by the national population and negatively influenced by the foreign population and by the parameter of "protection" Ω that, anyway, at the denominator has an ambiguous role.

Then, once we have the number of varieties, we can get the final formulations for the **cut-off marginal costs** to enter in the domestic and in the foreign markets:

(VIII) $$\boldsymbol{c_d = \left[\frac{f_i(\beta-1)}{f_d(1+\Omega)}\right]^{1/k}} \quad \text{and} \quad \boldsymbol{c_x = \left[\frac{\Omega f_i(\beta-1)}{f_x(1+\Omega)}\right]^{1/k}}$$

Here the role of the shape parameter k and the presence of Ω (that in c_x appears both at the numerator and denominator, with an ambiguous effect also here) are significant; however, is clear that the choice of the Pareto distribution and the magnitude of its shape parameter k play an important role in determining the values of those figures. We will closely see in the following paragraphs how all these parameters may affect our variables from the liberalization point of view, so for the moment the discussion of these equations should be postponed.

104 The number n of total plants of a nation is simply obtained substituting ω of (III) into the cut-off condition for domestic goods and then expliciting n, and the same should be done for the home export cut-off condition even if with a little bit more complicated computations to get n^*. To get c_d and c_x, one must substitute n into the free-entry condition using also the cut-off conditions and the Pareto distribution to evaluate an explicit solution.

Finally, we can have also the numbers of **varieties consumed** at home and overseas, numbers that for the aforementioned reasons do not coincide with the total number of produced varieties:

(IX) $$\boldsymbol{n_c = \frac{L(1-\Omega\psi)-L^*(\Omega-\psi)}{f_d\beta(1-\Omega^2)/[(\beta-1)\mu]}}$$

where again between home and foreign specifications the only differences are that the symbol * for the populations L must be inverted, and where $\boldsymbol{\psi \equiv \left(\frac{\phi}{T}\right)^{\beta} \leq 1}$, that is nothing more than the ratio of the two our last cut-off marginal costs for domestic and export productions.[105] It is easy to see how the national population encourages the development of new varieties, while Ω has the ambiguous impact we have already seen before.

The final step for our *equilibrium* consists in the evaluation of the trade volume. It should be clear that the value of a X-type firm's export is $c^{1-\sigma}\phi\mu L/(\omega\sigma)$, while the cut-off condition imposes $\frac{\mu E}{\omega}(c_x)^{1-\sigma} = f_d$ (remembering that $E = L$); combining these conditions, we can get the per-firm export v for an exporting firm with average c:

$$\boldsymbol{v(c) = \left(\frac{c}{c_x}\right)^{1-\sigma} f_x},$$

that is coherent since marginal costs negatively affect this value, while the (for hypothesis) bearable fixed-cost may be charged and increase the value of exports.

If we integrate this value for all the X-type firms, weighting by the frequency of being an X-type, that is,

$$\boldsymbol{V = \int_0^{c_x} \left(nv(c)\right) \; dG[c|c_d]}$$

we get the total value $\boldsymbol{V}$ of exports for a country in term of our *numeraire* good T, with the help also of the *equilibrium* equations (**VII**) and (**VIII**):

$$\boldsymbol{V = \frac{\mu\Omega(L-\Omega L^*)}{(1-\Omega^2)}}$$

105 The number n_c of consumed varieties is equal to n plus $n^*\left(\frac{c_x}{c_d}\right)^k$ that is the fraction of *imported* varieties; substituting for (VII) one can get (IX).

It is important, as final point, to notice how prices depend on c, and then how they may vary among different varieties, while in the standard intra-industry trade models the heterogeneous goods share the same price.

We are now able to turn to the analysis of the effects that trade-liberalization policies may have on the economic aggregates in the Baldwin-Forslid model.

The Effects of Liberalizations - I:
Lower Marginal "Iceberg" Trade Costs with Symmetric Countries

Our first focus concerns the effects of decreasing marginal iceberg - trade costs τ have on trade assuming that the two nations involved are symmetric (and so $L = L^*$).

As first thing through (**VIII**) we can see how a decrease in trade costs delivers lower domestic cut-off marginal costs c_d but higher export cut-off marginal costs c_x, through the action of Ω and even before of ϕ, that in the second of those equations has an overall positive effect. These are the same qualitative results given by the Melitz (2003) model.

It is easy to understand instead how, with infinite trade costs, trade-freeness goes to zero and then not even the most efficient X-type plant would be able to bear those costs and export. Obviously, since we are dealing with symmetric countries, those results works for both countries. In particular, for hypothesis, we are in the case (see (**IV**)) in which $F_x > F_d$ (or also $T \equiv F_x/F_d > 1$), that also intuitively is a correct assumption to take: these discussed results are visible in **Figure I**.

The other possible case is the one with $F_d > F_x$; in such a case, given the (relatively high) level of ϕ, when $c_x > c_d$ then only these most *inefficient* D-type firms are able to export, a meaningless event.

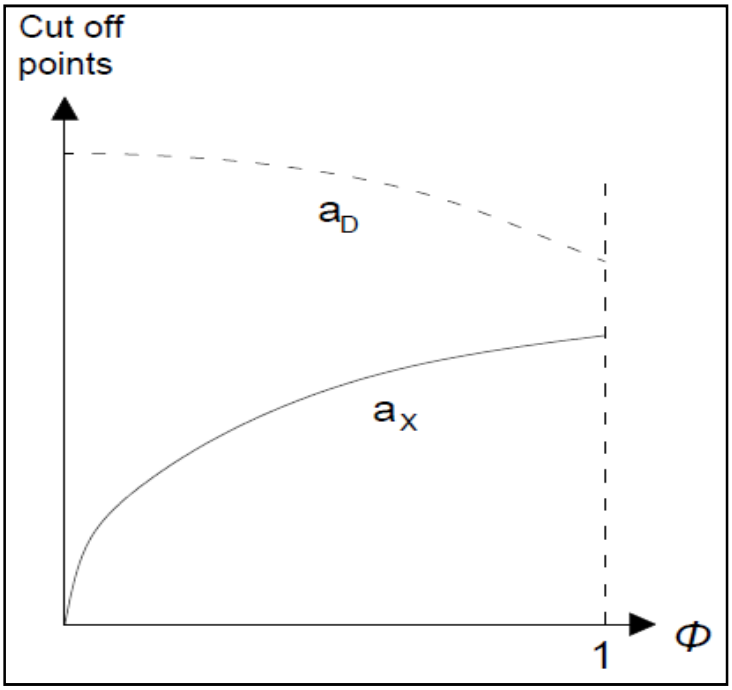

Figure I - The Effect of Liberalizations on Cut-off Marginal Costs

A decrease in τ then clearly has effects also on the produced varieties and then on the number of goods consumed in a nation, that - is well to remember it - correctly do *not* coincide since not all *foreign* firms are able to export their specific product.

Here we have a first clash with an unusual result, a peculiar outcome of the Baldwin-Forslid model: the anti-variety effect of trade liberalization.

Indeed, the impact of a lower τ on (**VII**) distinctly goes in the direction of a lower number n of varieties produced in a nation: that is, this is the first consequence of the aforementioned "McDonaldization-effect". In fact, we can see that the model exhibits a peculiar so-called "**anti-variety**" effect, meaning that an increase in trade openness is able to *reduce*, and not to increase as all the standard monopolistically trade models show, the number of varieties produced in nation.

Analytically speaking, this means that the first derivative of n with respect Ω is negative and in fact it can be written as:

$$\frac{\partial n}{\partial \Omega} = -\mu(\beta - 1)\frac{L^*[2\Omega+(1-\Omega^2)]+2\Omega L}{\beta f_d(1-\Omega^2)^2} < 0$$

And it is not over: since the proportionality factor of this proportional change $\hat{\boldsymbol{n}}$ (*i.e.*: $\hat{x} = \partial x/x$) with respect $\boldsymbol{\phi}$ in n is given by:

$$\hat{\boldsymbol{n}}(\boldsymbol{\phi}) = -\boldsymbol{\beta}\hat{\boldsymbol{\phi}}\frac{\boldsymbol{\Omega}}{\boldsymbol{\Omega}+\mathbf{1}}$$

(and remember that $\Omega = \phi^{\beta}\left(\frac{F_x}{F_d}\right)^{1-\beta}$, and with $\frac{\Omega}{\Omega+1}$ that embodies the *national expenditure share on imports*),[106] then the *decrease* in the number of varieties *increases* with trade openness: the marginal variation given by a freer commerce has an *increasing negative impact* on n: that is, the second derivative $\frac{\partial n}{\partial^2 \Omega}$ is positive:

$$\frac{\partial \boldsymbol{n}}{\partial^2 \boldsymbol{\Omega}} = \boldsymbol{\mu}(\boldsymbol{\beta}-\mathbf{1})\frac{\mathbf{L}^*[\mathbf{2}+\mathbf{2\Omega}+\mathbf{8\Omega}^2-\mathbf{4\Omega}^3]+\mathbf{2L}(\mathbf{1}+\mathbf{3\Omega}^2)}{\boldsymbol{\beta} f_{\mathbf{d}}(\mathbf{1}-\boldsymbol{\Omega}^2)^3} > 0$$

This means that the reduction in the number of local plants will be fostered as trade becomes freer, as can be seen with the help of the *solid* line in **Figure II**.

This happens because, with lower trade costs, the number of imported varieties raises, and these foreign varieties can push out of the market some relatively inefficient D-type firms in a figure that *exceeds* the number of new foreign varieties.

Anyway, the exact magnitude of this process can not be computed here, where a quantitative estimate is neither possible nor wanted and, then, nor attempted, too.

106 Since the imported variety *j* market-share is $(\phi c_j^{1-\sigma})\omega$, if we integrate for all the imported varieties we finally get $\frac{\Omega}{\Omega+1}$.

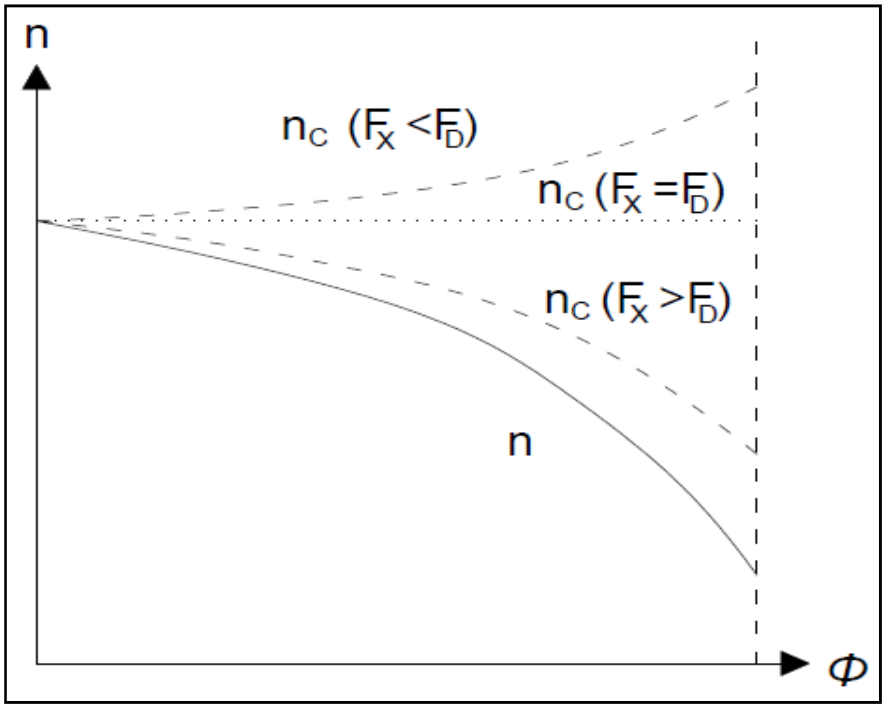

Figure II - The Decrese in the Number of Produced ($\boldsymbol{n}$) and Consumed ($\boldsymbol{n_c}$) Varities Due to Liberalizations

In the paper by Melitz (2003) was already underlined how trade liberalization under similar assumptions has ambiguous effect; however, in that paper the number of *consumed varieties* is not computed.[107]

We can do that right now, still assuming perfectly symmetrical countries, with equation (**IX**) that can be rewritten as:

$$\boldsymbol{n_c} = \frac{[\mathbf{1}-(\mathbf{1}/\boldsymbol{\beta})]\boldsymbol{\mu L}(\mathbf{1}+\boldsymbol{\phi}^{\boldsymbol{\beta}}\boldsymbol{T}^{-\boldsymbol{\beta}})}{\boldsymbol{f_d}(\mathbf{1}+\boldsymbol{\phi}^{\boldsymbol{\beta}}\boldsymbol{T}^{\mathbf{1}-\boldsymbol{\beta}})}$$

We can see how - always being in the case $F_x > F_d$ - the consumed varieties decrease with trade liberalization in the sense of lower iceberg-costs, even if at first sight the impact of ϕ can be a little bit obscure.

Here, then, the anti-variety effects completely emerges and shows all his consequences. The reduction in both *locally produced* (solid line) and *overall consumed* (dashed line) varieties in each

107 See Melitz (2003) in *Econometrica*, Vol. 71, No. 6, at page 1716.

nation can be seen in **Figure II**, where is reported also the more "conventional" *pro*-variety effect that turns out in the neglected case $F_d > F_x$.

The fact that n decreases faster than n_c means exactly that imported varieties are substituting the national ones with a proportion-scale bigger than unity: we will then have that one foreign good eliminates more than one domestic variety.

Always in Figure II, the straight line refers to the case $T = 1$. This last particular case represents the situation of no international fixed-costs: in fact, when $T = 1$, n_c is not affected by changes in ϕ. This case can be useful to better understand the "unusual" anti-variety result of our investigation: in such a case, the two cut-off marginal costs meet and there are clearly no differences in prices between national and foreign varieties, therefore they could be interchanged in a 1-for-1 proportion. But if ϕ is high enough, like in the basic case $T \equiv F_x/F_d > 1$, then imported varieties will have a sufficiently low price, relatively to national ones, to conquer new market-shares to the detriment of the domestic ones, following a proportion-factor that increases as commerce becomes freer, as we have seen.

In such a situation, so, more than one D-type firm will be replaced by just one foreign variety, and *viceversa* in the opposite case, where the classical *pro*-variety effect will arise, but having as assumption that $T \equiv F_x/F_d < 1$, that is only a thoretical case that we must refuse in our framework.

Simply put, all these evidences we have discovered right now mean that, under the perspective of the informal definition given by the neologism "*McDonaldization*", the model predicts that each new fast-food of a foreign multinational company will eliminate from the market a couple (or anyway, *more than one*) of local varieties under the guise of local restaurants or coffee-bar.

So, this anti-variety effect means, from an opposite point of view, that the higher the barriers to trade, the higher the number of varieties produced in a nation, to the detriment of the imported ones: put in this way, perhaps we can find the anti-variety effect more intuitive, since it reflects the natural consequences of a sort of "protectionism" imposed by the governament against imports; the overall consequences of such an hypothetical policy, on the number of varieties produced and consumed, are a possible the result of a "blind" international economic policy that would try to defend national industry.

The Effects of Liberalizations - II:
Lower Marginal "Iceberg" Trade Costs with Asymmetric Countries

We now turn to the analysis of the effects of lower iceberg - trade costs this time in the case of *asymmetric* countries, supposing that the "Home" nation with n plants would be the bigger one (and so $L > L^*$).

Since nations are not perfectly identical, then, it is useful to think about their respective $\boldsymbol{s_n}$ share of worldwide firms' mass $\boldsymbol{n^w}$, that, for Home, is:

(X)
$$\boldsymbol{s_n} \equiv \frac{\boldsymbol{n}}{\boldsymbol{n^w}} = \frac{s_E - \Omega(1-s_E)}{1-\Omega}$$

with

$$\boldsymbol{n^w} \equiv \boldsymbol{n} + \boldsymbol{n}^* = \frac{\mu(\beta-1)(L+L^*)}{f_D\beta(1+\Omega)}$$

and where we can naturally write the $\boldsymbol{s_E}$ national world expenditure-share as $\boldsymbol{s_E} = \frac{L}{L+L^*}$; given these preliminary specifications, if we make the proportional change of (**X**) with respect s_E we get:[108]

(XI)
$$\hat{s}_n(s_E) = \hat{s}_E\left[\frac{s_E}{s_E - \left(\frac{\Omega}{\Omega+1}\right)}\right]$$

This equation tells us that the **home-market effect** is present in the model and it actually works in this context of asymmetric countries.

In fact, we can model the HME in the simple way of thinking that the national s_n share of world' mass of firms n^w rises more than proportionally with the increase of its worldwide share of expenditure s_E. And the equation (XI) actually states that the HME does exists in the model since the coefficient of $\hat{s}_E$ in the square brackets is bigger than 1.

Moreover, we find once again in that parenthesis the expenditure share on imports (that positively acts with respect $\hat{s}_n$) $\frac{\Omega}{\Omega+1}$, by which is also immediately comprehensible that the HME, too, is characterized by the same "magnification" effect in the number of varieties produced in the symmetric countries scenario: that is, the HME becomes stronger as trade becomes freer (national expenditures shift with higher and higher magnitude to national varieties as trade liberalization increases).

The same effects can naturally be found regarding the mass of plants in a nations, completing the overall scope of the HME; in fact, the proportional change of s_n in (X) with respect the openness to trade Ω reaches:

$$\hat{s}_n(\Omega) = \hat{\Omega}\left\{\frac{[\Omega(2s_E-1)]/(1-\Omega)}{s_E-\Omega(1-s_E)}\right\}$$

108 $\widehat{s_n}$ is obtained applying the identities for s_n and s_E into (VII).

In fact, the first and second derivatives of s_n with respect Ω are:

$$\frac{\partial s_n}{\partial \Omega} = \frac{2s_E+1}{(1-\Omega)^2} > 0 \qquad \text{and} \qquad \frac{\partial s_n}{\partial^2 \Omega} = \frac{4s_E+2}{(1-\Omega)^3} > 0$$

Recalling that $s_E = \frac{L}{L+L^*}$, we can see that if home-nation has the larger mass of consumers (*i.e.*: $L > L^* \Leftrightarrow s_E > \frac{1}{2}$), than the opening to trade will increase the mass of national plants (I derivative), once again facing also the increase in magnitude as trade becomes freer (II derivative).

Moreover, from (**X**) we can see that the extreme case in which all the M-sector's plants are located in only one nation is reached when $\boldsymbol{\Omega = \frac{L^*}{L} = \Omega^s}$.

But we must specify an other point about the variation in the national mass of firms with respect the openness to trade: it varies non-monotonically. This happens because, as we can already see in the equations specified in (X) and (XI), the progressive magnification of the HME influences also n^* intreacting through n, that raises with the openness to trade as we have seen.

In fact, taking the first derivative of n given in (**VII**) with respect Ω and rearranging the terms we have that:

(XII)
$$\frac{\partial n}{\partial \Omega} = \boldsymbol{\mu}\left(\mathbf{1} - \frac{1}{\beta}\right)\frac{2\Omega L - L^*\left(1+\Omega^2\right)}{f_d\left(\Omega^2-1\right)^2}$$

This scripture is rather ambiguous, and it is not simple to correctly identify its magnitudes or at least its sign; but, proceeding by special cases, we can see that if $\Omega = 0$, then the sign of the derivative is negative, and if $\Omega = \Omega^s$ it becomes positive (in this particular case we must limit the domain of Ω, excluding that it could be equal to 1, so henceforth: $0 \leq \Omega < 1$).

So, the trend of the derivative is clearly non-monotonic; but we can state that this non-monotone pace generated by the interaction of n is for the smaller, foreign, starred nation undoubtedly negative since all the "de-location effects" of the general HME go in the same direction.

The behaviors (clearly different for home and foreign countries) of the first derivative of equation (XII) under analysis are illustrated in **Figure III**, for both nations.

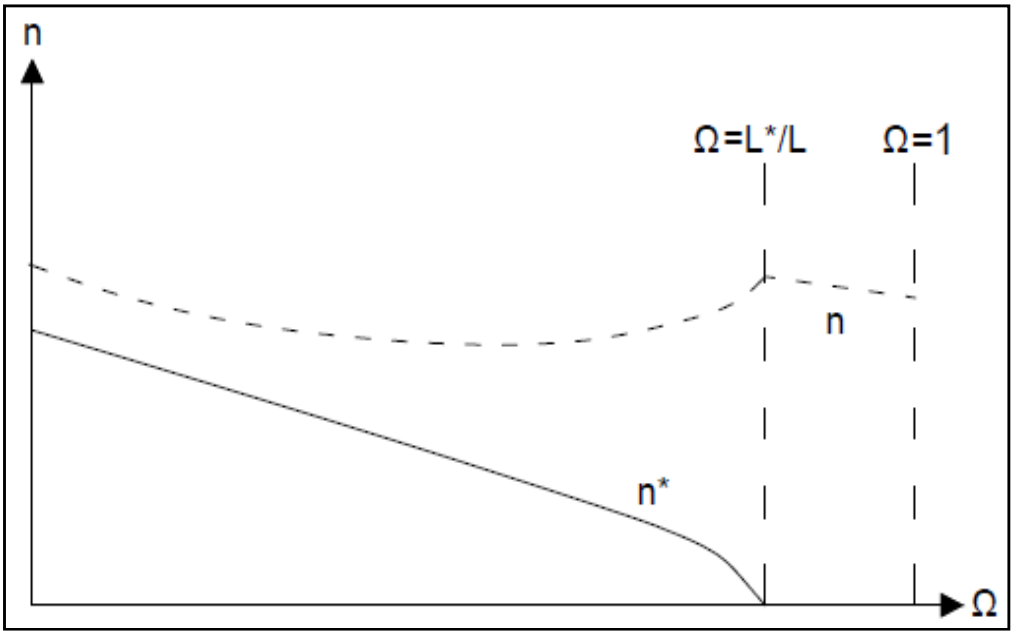

Figure III - The Behaviors of the Mass n *of Varieties for the Two Asymmetric Countries*

If we proceed deeper in our analysis, we can suppose now that not only the number of active plants, but also the number of consumed varieties is influenced by the asymmetry of nations, and then that the HME acts directly also on the consumers' basket variability. If we rewrite our equation (**IX**) for n_c, substituting where possible for Ω following $\Omega = \psi T$ and rearranging, we get:

$$\textbf{(XIII)} \qquad \boldsymbol{n_c} = \boldsymbol{\gamma}\left[\boldsymbol{L}\frac{1-\left(\frac{\Omega^2}{T}\right)}{1-\Omega^2} - \boldsymbol{L}^*\frac{\Omega(T-1)}{T(1-\Omega^2)}\right], \qquad \text{with} \quad \boldsymbol{\gamma} = \frac{\mu\left(1-\frac{1}{\beta}\right)}{f_d} > 0$$

Once again, the only difference between Home and foreign nations is that the starred L is inverted. The magnitude of this equation is not clear, since it depends on Ω in both the two terms in brackets, with the first one that increases with Ω (if $T > 1$), while the second one always decreases with Ω: at the end of the day, the overall magnitude depends on the population size, on freedom of trade and on the ratio T among fixed costs, and then the ultimate effect is not clear.

However, if we take the first derivative with respect Ω we obtain:

(XIV) $$\frac{\partial n_c}{\partial \Omega} = \gamma \left\{ \frac{(T-1)\left[2\Omega L - \left(1-\Omega^2\right)L^*\right]}{T\left(\Omega^2-1\right)^2} \right\}$$

Once again, it is difficult to disentangle the mere magnitude of this ratio; but if we go ahead, making a step forward evaluating the derivative of (**XIV**) in the two crucial points where $\Omega = 0$ and $\Omega = \Omega^s = \frac{L^*}{L}$ (the also so-called "sustain-point", that breakeven point that once reached all worldwide plants are located in only one nation), we find that:

$$\frac{\partial n_c}{\partial \Omega}(\Omega = 0) = -\gamma \frac{(T-1)L^*}{T} < 0, \qquad \frac{\partial n_c}{\partial \Omega}(\Omega = \Omega^s) = \gamma(T-1)\frac{2-\left[1+\left(\frac{L^*}{L}\right)^2\right]}{T\left[\left(\frac{L^*}{L}\right)^2-1\right]^2}L^* > 0$$

The overall effects on consumed varieties for both nations (one must swap the starred L to see the equations referred to the small, foreign country) follow the path of the total produced varieties found at the beginning of the paragraph and shown in Figure III: in **Figure IV** are then represented the trends for both n_c when $\Omega < \Omega^s$ (so with $\phi = 1$), and they clearly depict the general anti-variety effect that marks all this model.

In fact, in the evaluation of the first derivative in $\Omega = 0$, we can see very well how openness acts against variety when trade barriers are high; however,a freer trade turns instead to foster the number of consumed variety when we are close to the sustain-point, as we can image from the non-monotonicity of (**XII**) in Figure III (but, in the special case in which $\Omega > \Omega^s$, that is, all worldwide plants are located in the bigger country, the consequent effect is a new reduction in variety, since we known in such a case freer trade reduce monotonically the number of total variety).

The only difference between asymmetric countries in this case is given by the fact that consumed varieties decrease monotonically for the smaller nation (that is, $\frac{\partial n_c{}^*}{\partial \Omega} < 0 \; \forall \; \Omega$ for $T > 1$).[109]

So, the anti-variety evidences emerge then for both countries in a neat way also in the asymmetric case: deeper commercial relations among nations reduce domestic production of varieties and, for the *smaller* country, *always* reduce the number of consumed varieties, sometimes also significantly. The overall effect of the bigger country is instead more ambiguous, as

109 In fact, we can rewrite the numerator - that is the only part of interest - of (XIV) for the foreign nation as:

$$\left(2 - \frac{1+\Omega^2}{\Omega}\frac{L}{L^*}\right)\Omega(T-1)L^*,$$

and since $0 \leq \Omega < 1$ and $\frac{L}{L^*}$>1 then the first term in brackets is always negative.

equations (XII) and (XIV) show; however, the presence of a general anti-variety tendency is actually present also for the larger nation.

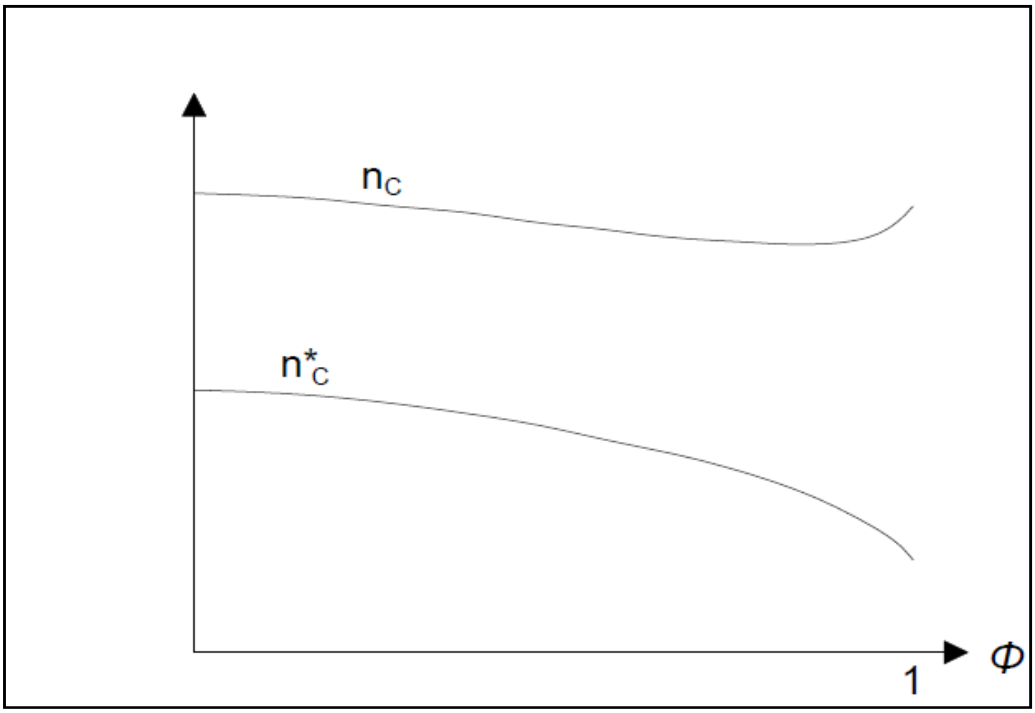

Figure IV - The Trends for the Numbers of Consumed Varieties with Asymmetric Countries

Regarding the *direction* of the trade, if we make the proportional change of our equation for the aggregate value of national export V with respect Ω, and then we substitute and rearrange with the help of (**X**), we can get:

(XV) $$\widehat{\boldsymbol{V}}(\boldsymbol{\Omega}) = \widehat{\boldsymbol{\Omega}}\left\{\frac{s_E\left(1+\Omega^2\right)-2\Omega(1-s_E)}{[s_E-\Omega(1-s_E)](\Omega^2-1)}\right\} \quad \text{with} \quad \widehat{\boldsymbol{\Omega}} = \boldsymbol{\beta}\widehat{\boldsymbol{\phi}} + \widehat{\boldsymbol{T}}(\mathbf{1}-\boldsymbol{\beta})$$

The inspection of this equation shows one more time the consequences of the HME: since moving Ω we are acting also on marginal trade costs (see (**VI**)), this means that the larger country

will be able to put on the table all its mass of firms, whose share of exporter plants and then of the total exports-value will increase as commerce gets freedom.

It is important, however, to notice that the inverse holds for the smaller country for a sufficiently small value of L^*, through the action of (**VII**) and (**X**): the value V of national exports decreases as trade becomes freer since the mass of firms collapses as Ω increases.

Focusing at the firm-level, we can find some other results similar to those we can find in the paper of Melitz (2003): if we differentiate the per-firm export $v(c)$ with respect openness to trade, and we rewrite it as function of the marginal costs c, we can see how this volume positively change with Ω and with the size of a firm:

$$\frac{\partial v(c)}{\partial \Omega} = v(c)\left(\frac{\sigma-1}{c_x}\right)\frac{\partial c_x}{\partial \Omega}$$

Moreover, the new entrants in the export market will be systematically smaller than incumbents, since the decreasing in marginal trade costs allows them to enter in a market that was previously forbidden because their efficiency was just below the cut-off level; with liberalization, they are able to compete in the worldwide commerce but their export volume will be still lower than the most efficient, incumbent firms.

Let now pass to the last section devoted to the different cases of possible way to implement trade liberalization, this time focusing on the effects of lower co-called "beach-head" costs.

The Effects of Liberalization - III: Lower "Beach-head" Costs

Up to this point we have dealt with trade costs that in real life are represented by concrete, actual industrial costs, mainly due to transport needs; but a huge part of the "barriers" that are still lifted up against trade, acting as obstacle with respect freer commerce, are constituted by the so-called "technical barriers to trade" ("TBTs"). Those technical barriers consist of the whole - and usually still huge - amount of, for example, technical regulations, standard quality laws and sanitary measures (think about all the limits and the restrictive rules that control and are set to supervise food-trade in all its sides), regulations that often are still correct and necessary but anyway constitute, in theory, an obstacle - that with political integration and economic and social development in many cases become antiquated and can be abolished - against interaction among nations and then their political, social and, last but not least, economic integration; and its

nowadays clear that economic integration is one of the best ways to avoid conflict between countries, in the moment in which economic cooperation and the sharing of productive aims and scopes *can* wipe out some, or the most part, of the reasons for social fights and armed conflicts within and between nations.

In these months we can see how much difficult can be the attempts to define lower technical barriers to trade, in order to improve international commerce particularly in those years of economic difficulty, and at the same time to protect national interests, acting - it is obvious - also under the influence and the pressures of groups of particular interests eventually involved in those new regulations: we are taking about the well-known TTIP (T*ransatlantic Trade and Investment Partnership*) that was being defined in the last year about among EU and U.S., and on which expectations about its economic development consequences and business opportunities are really high but that at the same time whose difficulties in the negotiation phase are clear and undeniable for anybody.

In the Baldwin-Forslid model, all these regulatory barriers are included in the beach-head costs needed to establish a starting position in a new market, and this also helps to formally explain why $F_x > F_d$; so the effects of such a liberalization form move this rate between fixed costs towards unity ($T = F_x/F_d \cong 1$). To be precise, a *ceteris paribus* reduction in F_x means a trade - fixed costs liberalization (the cases we have seen up to here), while a simultaneous decrease in both F_x and F_d stands for a domestic de-regulation concerning TBTs.

Starting from (**VII**) and up to the equations regarding the volume and the value of export, we can see how a decrease in TBTs has the same identical effects of a decrease in marginal trade costs (that is, when the degree of freedom ϕ shows $d\phi > 1$, a positive first derivative); intuition clearly supports this results. The only difference lies in the number of consumed varieties, whose behavior as consequence of de-regulation is a little bit ambiguous.

However, if we try to find a way to solve this uncertainty differentiating (**IX**) with respect F_x, assuming that $F_x = F_d \equiv T = 1$ and actually computing that derivative in $F_x = F_d$ we have:

$$\frac{\partial n_c}{\partial F_x}(F_x = F_d) = \boldsymbol{\gamma}\frac{\left(\phi^{\beta}L - L^*\right)\left(\phi^{\beta} - \phi^{3\beta}\right)}{F_d\left(\phi^{2\beta} - 1\right)^2} > 0, \qquad \text{with} \quad \boldsymbol{\Omega} < \boldsymbol{\Omega}^s$$

which again may appear obscure but that after a short analysis suggests that, starting from already very permissive levels of TBTs, further de-regulation increases the number of consumed varieties in both nations (if it were the case, also in both smaller and larger countries).

So, de-regulation may help to make trade freer among nations in the same way merely industrial decreasing fixed costs can do it: less (and/or less restrictive) bureaucratic obstacles and formalities surely incentive firms in their exporting activity.

It is now time, as last part of our discussion, to analyze the disaggregate and aggregate consequences on welfare that liberalizations have in the Baldwin-Forslid model.

The Effects of Liberalizations On Welfare

The non-conventional results of the Baldwin-Forslid model on the consequences of a freer trade on the number of produced varieties in a nation involved in the process of globalization hade made authors wondered what peculiar outcomes about welfare in general and redistributive effects in particular could emerge in their model.

The nested utility-function we have assumed at the beginning of the dissertation,

$$\boldsymbol{U} = \mathbf{ln}\left(\frac{\boldsymbol{E}}{\boldsymbol{P}}\right)$$

thanks to its *indirect* nature reveals that the welfare of the representative consumer depends only by the variations in the price-index, since the income is exogenously given.

If we adopt the Pareto distribution and substitute for (**VII**), we can define our price-index in a more useful way, that is:

(XVI) $$\boldsymbol{P} = \boldsymbol{c_d^{\mu}}\left(\frac{\mu L}{f_d}\right)^{\frac{\mu}{(1-\sigma)}}$$

As usual, the only difference between countries lies in the starred, or not starred, L.

The price-level increases as cut-off marginal costs become higher (and then must be rewarded) and naturally with the mass of consumers and their share-expenditure on M-goods. From this scripture we can already extract some interesting, even if not innovative, results: as trade becomes more open, we have seen that marginal trade costs become lower, so that the price-index decreases with trade openness, delivering an higher welfare to consumers.

For what concerns consumers, we must also notice that their nominal wage cannot be affected by change in the degree of free-trade since labor L is our *numeraire*.

If we recall the Melitz (2003) model, the results it reached are very neat and clear: society will benefit from internationalization of an higher welfare-level in any case, since the possible losses in profits suffered by firms would be at least recovered with an increase in overall efficiency of the industrial sector. Relatively less efficient plants will face diminishing market-share and profits, while relatively inefficient ones will be pushed out of business.

The same situation can be found in the Baldwin-Forslid model: X- and D-type firms will face different consequences from a general opening of international commerce, since they have different gains from their activities (even if *average* profits of the typical plant of an industrial sector are of course zero).

So, it should not be surprising to understand how D-firms would be against trade liberalization, and how X-firms would be in favor of a freer commerce between nations instead. We can see the effects of these legitimate position every day in our public policy debates,

especially when the domestic economic trend is not positive, but in the same way sometimes we can also see illegitimate attempts to lead national economic policies in a direction that acts against the overall social welfare of a country but in favor of those main economic agents that may stand on the looser side of internationalization and have the chance and the resources to influence economic debate for their particular interests.[110]

We can then give a look to the possible variations of firms' revenues in the case of a freer trade: our typical firm faces a classical "Ricardian" surplus $\boldsymbol{S}$ and profits π, that in this context means its sales times the profit margin, that in the end is, for merely domestic and exporting plants respectively:

$$\textbf{(XVII)} \qquad \boldsymbol{S_d = \pi_d(c)} \;=\; \left(\frac{c}{c_d}\right)^{1-\sigma} \frac{f_d}{\sigma}, \qquad\qquad \boldsymbol{S_x(c) = \pi_x + \pi_d} \;=\; \left(\frac{c}{c_d}\right)^{1-\sigma} \frac{f_d}{\sigma}(\boldsymbol{1+\phi})$$

Although nominal wages of workers/consumers are unaffected by a change in $\boldsymbol{\phi}$, the same can not be stated for firms' remuneration.

It is important to notice, in (XVII), the role played by marginal and fixed costs in determining the profits of a firm in this model, since they seem to have an active an positive role; the intuition for it should rely on the fact that such costs must be compensated and then generate higher profits.

If we plug (**VIII**) into (**XVII**) and we consider the proportional change of firms surplus with respect a change in the trade openness in the sense of lower marginal trade costs, we can see that, everything else fixed equal, the profits of firms exposed to (a freer) international trade are re-distributed from the less productive plants to the most efficient ones:

$$\textbf{(XVIII)} \qquad \boldsymbol{\widehat{S}_d(\widehat{\phi})} \;=\; \boldsymbol{\widehat{\pi}_d} \;=\; \frac{-\Omega}{1+\Omega}\hat{\phi} \;\leq\; \mathbf{0}, \qquad\qquad \boldsymbol{\widehat{S}_x(\widehat{\phi})} \;=\; \frac{\phi-\Omega}{(1+\phi)(1+\Omega)}\hat{\phi} \;\geq\; \mathbf{0}$$

As intuition can suggest, and having as confirmation Melitz (2003), we can see how a freer international commerce acts against D-firms: firms able to sell their product only in the domestic market will be negatively affected in their nominal rewards by a freer trade. The result regarding X-firms may seem ambiguous, but an inspection of the signs establishes that it is positive.

The analysis of the *real* rewards, instead, is a little bit more complicated.

We know that, since the markup is constant, a change in a firm's profits must be given by a proportional change in its sales. We can also state that $\hat{S}_d < \hat{S}_x$ and that $\widehat{w} = 0$. To derive scriptures useful to define real variations, we must consider also the change in the index price P of (XVI), and comparing this change with respect a firm's profits variation.

110 One condition we need to include these simple "political" reasoning in the model would be to assume a reasonable depreciation rate, sufficiently low to make entrepreneurs interested in the debate since their investment would be able to see the possible positive or negative effects of a deeper liberalization of international trade.

We have, then:

$$\widehat{S}_d - \widehat{P} = \hat{c}_d(\sigma - 1 - \mu) \qquad \text{and} \qquad \widehat{S}_x - \widehat{P} = \hat{c}_d(\sigma - 1 - \mu) + \hat{\phi}\frac{\phi}{1+\phi}$$

with $\widehat{w} = \widehat{P} - \hat{c}_d$.

The first equation varies with marginal trade costs, the second is influenced also by the degree of trade-freedom through its second member.

Since the variation in marginal trade costs for D-firms is negative, as we well known, as commerce becomes more open (that is, $\partial\phi > 0$), we are able to say that consumers/workers always gain, while D-firms will face a loss in their profits under the feasible condition that the elasticity of substitution among varieties would be sufficiently high, and precisely $\sigma > 1 + \mu$ (but even if this condition would be violated, X-types will be anyway the winners, as we are going to see).

Instead, X-type firms will see an increase in their overseas business bigger than the decrease in the domestic sales (due to foreign competition) that they may bear: if we plug (**XVIII**)[111] into our last equation for real rewards, we get:

$$\widehat{S}_x - \widehat{P} = -\frac{(\sigma-1-\mu)}{1-\sigma}\frac{\Omega}{1+\Omega}\widehat{\phi} + \widehat{\phi}\frac{\phi}{1+\phi}$$

Since $\phi > \Omega$ for $T > 1$ (that is, using an other scripture, $\frac{F_x}{F_d} > \phi \Leftrightarrow F_x > F_d$ and so we are always in the case in which trade is costly), we can state that:

(IXX) $$\widehat{S}_d - \widehat{P} < 0 < \widehat{w} - \widehat{P} < \widehat{S}_x - \widehat{P} > 0$$

Authors define this inequality-chain as a sort of "**Stolper-Samuelson - chain**" concerning firms' real rewards variations. It is important to notice how this sequence of inequalities holds without any impact of the size of nations, that here plays no role.

This scripture tells us how the main winner of a liberalization process are the firms able to exploit the business possibilities of a freer trade thanks to their relatively higher efficiency; these firms can see their earnings to increase with respect the real remuneration of consumers, who are winners themselves, as we have previously seen with (**XVI**), but with a lower magnitude with respect X-type plants. Losers are of course the relatively less productive plants not able to bear international trade costs, plants that see their rewards reducing because of foreign entering competition.

If we want to find an interpretation in a Stolper-Samuelson way of this process, we can state that "X-type capital", the type of capital used in exports, gains as trade become freer (or when its

111 The proportional variation of marginal trade costs can be rewritten as $\hat{c}_d = -\beta\hat{\phi}\frac{1}{k}\frac{\Omega}{1+\Omega}$, where k is the Pareto distribution's shape parameter.

freedom becomes "more intense"), and *viceversa* for the "D-type capital", where these two different "capital-qualities" are the two input of the usual Stolper-Samuelson model formulation - that would see, for example, an intensive and a not-intensive use of capital as productive factor associated with a not-intensive and an intensive use of labor, respectively, in the two different sectors in two nations.

This formulation has an interesting implication: profits of entrepreneurs behave like a fractal, since rewards are inversely related to marginal trade costs and both depend, at the end of the day, on the degree of freedom of trade.

This means that the rewarding-rate of X- and D-type capital shows a Pareto distribution with shape parameter $\rho + 1 + \sigma$.

As last part of our discussion about welfare gains (or losses) due to trade liberalizations, a few words must be spent regarding the case of a reduction in the fixed costs of export $\boldsymbol{F_x}$.

A reduction in the fixed beach-head costs seems to play against both D- and X-type firms, as we can see from (**VII**) and (**XVII**) combined: this happens because the reduction in those no more so high fixed costs must be compensated with lower profits.

This fact may seem to be not so in line with intuition, and in fact in the Melitz (2003) model is shown how a reduction in fixed trade costs generate overall gains for most productive firms, opening the export market to other entrants and pushing out of the market less productive plants.[112]

Summing Up the Results of the Baldwin-Forslid Model

To summarize what we have seen in these last pages with this detailed analysis of the Baldwin-Forslid model is can be useful to make once again a list of the "traditional" outcomes beside the innovative results offered by this framework focused on liberalization:

- Of course we can list as main result the peculiar **anti-variety effect** that clearly emerges as consequence of liberalization of trade *via* lower marginal trade costs: consumers, in general, face a reduction in the available goods in the same way a national industrial sector is lead to a reduction in the produced varieties because of competition brought in the domestic market by foreign firms. This effect sharply contrasts what was a consolidated result of the monopolistic competition market

112 See Robert, M. J., Sullivan, T., and Tybout, J. R., *Micro-Foundation of Export Booms*, *mimeo*, 1995, for a microeconomic foundation of the evidences like the ones described in Melitz (2003).

structure in the international trade, that is, the variety effect *à la* Krugman, where international trade extends the consumption choices of consumers. The effect of substitution brought by imported varieties to the detriment of domestic ones is the so-called "*McDonaldization*-effect", by which traditional local products are eliminated from the market by foreign cheaper varieties. The fact that foreign varieties are always cheaper is clearly not true in real life (think about automotive market, or the world of fashion products, where a *minimum* target price must be kept to save the appeal and the image of a brand), but for sure is true that imported varieties can push out of the market some national less productive (and/or, in real world, innovative) firms; we have seen how both total national varieties and consumed varieties decrease, but also that the *locally produced* number n of varieties falls faster than the number of *total consumed* varieties, meaning that imported ones substitutes with a rate higher than one-to-one the national less productive varieties.
At most, this evidence may suggest some social consideration about the intrinsic value of old, traditional, local products and about the possibility of use public resources as subsidies to keep those national product alive.
The main fact here, anyway, is that this "globalization effect" makes decreasing, instead of increasing, the total number of available varieties in a nation;

- In the asymmetric scenario, the anti-variety effect is a piece of the more general so-called **home-market effect**, that is in action with strength in this setup. As we have seen in the first chapter, this aspect of the modern trade theory has an increasing importance in theory, given some quite robust empirical evidences;

- Like in Melitz (2003), we have seen how **trade liberalization fosters productivity and its reallocation** among most productive plants, that are able to compete also in the foreign markets erasing also overseas the existence of the less productive firms. This gain in efficiency is reflected in this model in the increase in the rewards of X-type firms, the only ones that can conquer foreign market share (see Chapter I);

- Again, some liberalization effects of Melitz (2003), as the decrease in c_d besides the increase in c_x in the symmetric case or the fact that entrants are smaller in size than incumbents, find in this framework a sure confirm. In the same way, we have seen how profits shift from D-firms to X-firms as consequence of the difference in efficiency that make the latter competitive also overseas;

- Finally, the effect on welfare are substantially the same delivered by the Melitz (2003) model, where is shown how **trade always increases welfare**; here, a freer trade does the same. The results delivered by the Baldwin-Forslid model about welfare in particular are:

    - the aggregate productivity of the industrial system increases with trade openness since relatively less productive firms can not bear no more the

combined competition brought by both domestic relatively most productive and also entrant foreign firms;

- exporting, most efficient firms are clearly the winners of a liberalization process, since their efficiency allows them to exploit foreign markets, gaining market-shares and having higher profits. Domestic plants are the losers, facing losses in both market-share and profits: they could gain from freer trade only if the expenditure-share on the M-factor would be sufficiently high to sustain their business although the stronger competition, that is, only if $\mu > \sigma - 1$. Through the analysis, we have seen how the overall variation in welfare due to a freer trade is positive, and the intuition is clear: since the monopolistically competitive firms all realize their unique variety that however is well substitutable with the others, there is no distortion in a consumer's choice among local and imported varieties, once foreign plants have bear the trade costs; so the preference for foreign goods is unambiguously welfare increasing since imported varieties have lower prices.;
- nominal wages are not affected by changes in the trade degree of freedom;
- however, consumers gain in welfare thanks to lower prices due to foreign new entrants and their varieties, that of course eliminate more local products than they replace but offer substitutable varieties at lower prices, delivering then to a sure aggregate gain in welfare for consumers due to higher real wages.

❖ It is also clear from this model that the aggregate gains in productivity and the positive consequences of the McDonaldization-effect outweighs first, the loss in consumption-variety availability, and second, also the share-shifting and the reward-shifting from less productive firms to the most efficient, in a process that advantages consumers too.

These evidences, theoretically already founded by Melitz (2003) and here once again re-stated, may open the doors to the possible idea that in the world market prices may be set, in some cases, by explicit or implicit (if formally made following national and international rules) collusions among few big corporations or their associations, a fact clearly established in the last decades - for example, in the field of particular exotic agriculture products, air transports or for the oil - since, in the world market, is clear from both theory and empirics that just few firms can participate at the trade at the international level.

So, international trade seems to pose questions and matters that are all but solved, and also in this context, then, easy answers are difficult to obtain.

Chapter III
Trade Pattern and Trade Balance in the Baldwin-Forslid Model

This third and last chapter is devoted to a simple analysis of the pattern of trade and of the national account (focusing on trade balance) as they can be derived from the core of the Baldwin-Forslid model that we have seen in depth in the previous chapter.

This final section will also be the right place where we can discuss some peculiarities and also make some useful comments about the framework built by Baldwin and Forslid, particularly concerning the choice of the Pareto as the distribution for the firms' efficiency-rate and about the anti-variety effect that characterized the model.

Trade Pattern in the Baldwin-Forslid Model

In the *asymmetric* scenario proposed by Baldwin and Forslid in their model, there is no chance for the smaller nation to have a positive or at least an almost equalized trade balance: its exports will be systematically lower than its imports, delivering a permanent situation of imbalance in trade flows.

Indeed, if we try to equate the total values of imports and exports of the bigger nation (that is, we equate the exports of both nations), we would write:

$$\boldsymbol{V} = \frac{\boldsymbol{\mu\Omega(L - \Omega L^*)}}{\boldsymbol{1 - \Omega^2}} = \boldsymbol{EXP} = \boldsymbol{IMP} = \frac{\boldsymbol{\mu\Omega(L^* - \Omega L)}}{\boldsymbol{1 - \Omega^2}} = \boldsymbol{V^*}$$

For which level of Ω, our overall "degree of freedom" of trade, are then the exports of the two nations equal? Solving the equivalence, we get that:

$$\boldsymbol{\Omega} = \frac{\boldsymbol{L^* - L}}{\boldsymbol{L - L^*}} < 0$$

But, since $0 \leq \Omega < 1$, this condition can not be accepted.

This means that we will always have an imbalance in trade flows, an imbalance that at first sight must be in favor of the bigger nation; and we can reach this result from both analytical and intuitive ways.

Analytically, from our first equation we can see that in the asymmetric case:

$$\boldsymbol{(L - \Omega L^*) > (L^* - \Omega L)}$$

So, the right-member taken from the expression for Home exports is greater than the left-member since $L > L^*$ and then, *ceteris paribus*, Home exports are greater (in value) than Home imports.

Intuitively, from the emerging of the home-market effect it follows that in the Home nation will be placed an higher number of plants than overseas; and since productivity is distributed in the same way (through the Pareto distribution function) in the two countries, we will have an higher number of exporting firms placed at Home, *ceteris paribus* (and particularly, because preferences are the same in both nations).

Again, if we solve the equation for L^*, we actually find that the size of the foreign country that equals imports and exports is clearly $L^* = L$, that is, nothing more than basic symmetric case.

So, we will always have a positive trade imbalance in favor of the bigger nation in the Baldwin-Forslid model.

However, if we compute the first derivatives with respect Ω of the value of export, we have ambiguous results that do not allow us to determine the signs, since the second parentheses (for the first equation, $(L - 2\Omega L^*)$) of the two denominators depends on the value assigned to L and L^* and to Ω and can then invert the sign of the two derivatives:

$$\frac{\boldsymbol{\partial V}}{\boldsymbol{\partial \Omega}} = \frac{\boldsymbol{(1 - \Omega^2)\mu(L - 2\Omega L^*) + 2\Omega[\mu\Omega(L - \Omega L^*)]}}{\boldsymbol{(1 - \Omega^2)^2}}$$

and

$$\frac{\partial V^*}{\partial \Omega} = \frac{(1-\Omega^2)\mu(L^* - 2\Omega L) + 2\Omega[\mu\Omega(L^* - \Omega L)]}{(1-\Omega^2)^2}$$

Anyway, assuming that L is sufficiently greater than L^*, we will have that these two derivatives would have an intuitively correct and coherent signs (*i.e.:* positive the former and negative the latter one): the total value of exports increases with trade openness for the bigger nation at the expense of the smaller nation's export value (*i.e.:* Home's imports).

This happens because the home-market effect once again acts against the industrial concentration and development in the small nation in favor of the bigger one: we then have - for Home - a sort of "autarkic" effect by which a freer trade decreases the imports from the small nation - a situation that seems to be paradox but it is just the consequence of the home-market effect action, that concentrates industrial plants where it is more profitable.

However, this fact does not mean that the overall international trade value would necessarily decrease. In fact, if we compute the overall value V^w of worldwide exports we have:

$$V^w = V + V^* = \frac{\mu\Omega(L - \Omega L^*)}{1-\Omega^2} + \frac{\mu\Omega(L^* - \Omega L)}{1-\Omega^2} = \frac{\mu\Omega[L(1-\Omega) + L^*(1-\Omega)]}{1-\Omega^2}$$

And if we compute its first derivative with respect the overall trade openness we get:

$$\frac{\partial V^w}{\partial \Omega} = \frac{(1-\Omega^2)\mu(L - 2\Omega L^* + L^* - 2\Omega L) + 2\mu\Omega^2[L(1-\Omega) + L^*(1-\Omega)]}{(1-\Omega^2)^2}$$

The sign of this derivative depends on the value of Ω, that is crucail in the second parenthesis of the numerator. In fact, we have that the derivative is positive - even if computations are a little bit complex - for all the possible values of Ω:

$$\frac{\partial V^w}{\partial \Omega} > 0 \; \forall \, \Omega$$

This fact agrees with logic: a freer trade fosters the firms to enter in the world market and the to export their variety, increasing the total value of the international trade.

We will see in the following paragraph how these conclusions find a confirmation in the analysis of the trade balances of the two nations.

To conclude, in such a scenario it seems that the imbalance of trade flows will permanently be in favor of the bigger nation, that then, at first sight, should be a net creditor (with regard the international financial flows) of the smaller country, since this latter one will always have national expenditures higher than profits in the international market.

Anyway, the value of worldwide exports can increase, if the overall trade openness is sufficiently low, as we have already seen.

In the next paragraph we are going to better exploit this matter specifically reasoning about the trade balance of the two asymmetric countries of the model.

Trade Balance with Asymmetric Countries

A complete and tractable theory of the current account in international trade, with also firms heterogeneity assumed to make more complex the scenario, has not already been proposed by the research because it implies huge problems and complications in the moment one tries to precisely compute the trade flows (as highlined by Krugman and Melitz in their model, where just an overall theoretical "direction" of the trade flows can be determined).

In all the recent models of international trade, particularly in those of static nature like the Baldwin-Forslid one, then, the current account is assumed as balanced among nations. The same must then be assumed for the Baldwin-Forslid model, but with the following computations we will see how this assumption can not be confirmed so easily and also how the Traditional sector T plays an other crucial role in the model.

For simplicity, our analysis will be restricted to the mere trade balance, and not to the entire national current account, in order to stay in line with the original model and with the computations proposed in the previous paragraph.

Of course, we are always reasoning about the asymmetric case with $L > L^*$.

So, if we would try compute the a sort of Trade Balance $\boldsymbol{T.B.}$ for both nations in a vary simple way, we could use the expressions for V as previously made, writing than for Home:

$$\boldsymbol{T.B.} = \boldsymbol{V} - \boldsymbol{V}^* = \frac{\boldsymbol{\mu\Omega(L - \Omega L^*)}}{\boldsymbol{1 - \Omega^2}} - \frac{\boldsymbol{\mu\Omega(L^* - \Omega L)}}{\boldsymbol{1 - \Omega^2}}$$

that can be rewritten also as:

$$\boldsymbol{T.B.} = \frac{\mu\Omega[L(1+\Omega)-L^*(1+\Omega)]}{1-\Omega^2} = \frac{\mu\Omega[(1+\Omega)(L-L^*)]}{1-\Omega^2} > 0$$

while for the foreign nation the trade balance $\boldsymbol{T.B.}^*$ is:

$$\boldsymbol{T.B.}^* = \boldsymbol{V}^* - \boldsymbol{V} = \frac{\mu\Omega[L^*(1+\Omega)-L(1+\Omega)]}{1-\Omega^2} = \frac{\mu\Omega[(1+\Omega)(L^*-L)]}{1-\Omega^2} < 0$$

The latter of this last two scriptures highlines, better than the former, the role played by the difference in size of the two countries, difference that determines the signs of the trade balances: like in the previous paragraph, we have that the trade balance is positive for the bigger nation and negative for the smaller one, because of the gap between the two countries' dimensions; indeed, it is possible to proof that here too the two trade balances are equal when $L^* = L$.

If we compute the two first derivatives for the two Trade Balances with respect Ω we can see that their signs are what we expect:

$$\frac{\partial \boldsymbol{T.B.}}{\partial \Omega} = \frac{(1-\Omega^2)\mu(L-2\Omega L^*-L^*+2\Omega L)+2\Omega[\Omega\mu(L-\Omega L^*)-\mu\Omega(L^*-\Omega L)]}{(1-\Omega^2)^2} > 0$$

and

$$\frac{\partial \boldsymbol{T.B.}^*}{\partial \Omega} = \frac{(1-\Omega^2)\mu(L^*-2\Omega L-L+2\Omega L^*)+2\Omega[\Omega\mu(L^*-\Omega L)-\mu\Omega(L-\Omega L^*)]}{(1-\Omega^2)^2} < 0$$

These scriptures may seem a little bit ambiguous, but what matter here are the signs only, that are easy to determine: and they tell us that the trade balance increases (it varies positively) for the bigger nation, and *viceversa* for the smaller one, because of a freer trade. These computations are a confirmation of what we have stated about the total value $\boldsymbol{V^w}$ of the worldwide exports: with a freer trade, international trade increases in value; but this also means that the increase in the Home's exports is greater than the decrease of its imports (*i.e.:* foreign exports), for any admissible value of Ω, as previously established.

The only way that allows us to make equal the export-volumes in such a scenario is to use once again the Traditional sector, that in both nations is perfectly competitive and produces a freely tradable good, to justify the (negative) permanent imbalance in the trade volume of the smaller nation in trading the heterogeneous goods.

In fact, given the previous results, we must answer at least to one question: how can the smaller nation pay all its imports?

The only possible way to avoid the trade imbalance, then, is to think that the smaller nation can offset the losses suffered due to the trade in the Manufacturing goods with a greater production of the Traditional good, exporting the surplus of the homogenous variety to the bigger nation and using these profits to pay the manufacturing imports. This is clearly a stretching of the model, since it would be logic to assume that the bigger country had a higher production also in the Traditional sector thanks to its greater dimension.

Of course, to assume that exists an entire sector of the economy that exhibits no economies of scale (while the other one does) - and so it is perfectly competitive - and is characterized by the absence of trade costs is a really strong hypothesis, useful to build the model but that at the end of the day constitutes an abstraction from reality and a mere tool used by the authors to reach their aim; in this sense, and having neat and clear this limit, it can be considered a really good and useful assumption that may find many future applications in the research.

If we would try to image the existence of two currencies for the two nations, we must face the fact that in the Baldwin-Forslid model the interest rate is not considered; moreover, even if we would argue that our exchange-rate was a *real* exchange-rate, the structure and the hypotheses of the Baldwin-Forslid model do not allow us to easily introduce such an extension, given also the presence and the role of the perfectly competitive (and freely tradable) homogeneous good given by the T-sector.

All these facts, associated to the anti-variety effect that characterized the whole model, suggest a peculiar result concerning the total number $\boldsymbol{n^w}$ of worldwide firms when trade liberalization is implemented:

$$\boldsymbol{n^w} = \frac{\mu(\beta-1)(L+L^*)}{f_D\beta(1+\Omega)} \qquad \frac{\partial n^w}{\partial \Omega} = \frac{-[\mu(\beta-1)(L+L^*)]}{f_D\beta(1+\Omega)^2} < 0$$

This result is the confirmation of the anti-variety effect that characterizes the model and clearly means that the number of active firms in the world decreases with a freer trade. It is important to notice how also here the shape parameter k of the Pareto distribution enter in the formulas through β (and remember that $\beta \equiv \frac{k}{\sigma-1} > 1$).

This is a strange result that however is in line with the whole model and helps us to make some considerations about trade margins in the following, final paragraph.

Concluding Remarks

On the choice of the Pareto distribution. It is important to notice how all these anti-variety results, that are in contrast with all the previous, conventional results of the monopolistically competitive foundation of the international trade theory, depend on the particular specification adopted for the distribution of marginal costs (so, of the efficiency) among firms, that is, the Pareto distribution, that affects both the cut-off marginal costs and the number of firms and, through them, also the consumer's welfare, for example.

The choice of the Pareto distribution may be justified by the fact that it is one of the distribution that better fit to the empirical consumers' income distribution, as it as been show by many studies in the last decades and how Baldwin and Forslid highlined in their paper. Therefore, if it fits so well with the distribution of income among consumers, the Pareto distribution can be adopted also to model the firms' efficiency distribution, efficiency that affect their capability to make revenues; so, since firms are heterogeneous because of different efficiency-levels, such a distribution may fit very well the theoretical distribution of revenues depending on productivity in the same way it may fit the distribution of income among real heterogeneous consumers.

Indeed, as underlined by Baldwin and Forslid, the Pareto distribution can be adopted also to model the distribution of firms profits, as many recent researches seem to confirm: in our model, so, the rewarding-rate of X- and D-type capital shows a Pareto distribution with shape parameter $\rho + 1 + \sigma$.[113]

Chaney, in his well known paper of 2008 (see References), applied the Pareto distribution in his work concerning trade intensive (the exported volume of a good) and extensive (the number of varieties exported) margins, and also reported as there is actually a wide empirical evidence that the Pareto distribution may be considered "a good approximation of the upper tail of the distribution of firm sizes".[114] In fact, since exporters (that must be among the most efficient firms) are mainly also the *larger* firms, and therefore they lie in the upper tail of the size distribution, the Pareto distribution is a good candidate for a theoretical model of firm selection into export markets since it is clearly right-skewed. Simon and Bonini already in 1958 first noticed that the firms' size distribution is well described by a Pareto distribution; more recent evidences on this empirical regularity for the United States have been given by Axtell (2001) and Luttmer (2007), and Gabaix (2008) provided a survey on the prevalence of "power law" distributions for firms in the U.S. and in Europe.[115] Finally, the already quoted paper by Helpman, Melitz and Yeaple (2004) estimated a Pareto distribution for both U.S. and European firms to predict foreign direct investments.

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113 See Nirei, M., *Pareto Distribution in Economic Growth Models*, Hitotsubashi University, 2009, for applications of the Pareto distribution to the Solow and Ramsey models and for a resume of papers concerning applications of it to the consumers' income.

114 See Chaney (2008) in *The American Economic Review*, Vol. 98 No. 4, at page 1709.

115 See References for all the precise quotes about these last papers.

On the differences with the Chaney model (2008). For what we have just stated, the Baldwin-Forslid model might be considered, at first sight, an extension of the Melitz model that includes the assumption of Chaney of a Pareto distribution for firms' productivity. However, the analysis of Chaney focuses on the elasticities of trade flows, for both intensive and extensive margins, when trade costs vary.

In the Chaney model, indeed, the key scope of the analysis are the variation of trade margins with respect elasticity of substitution among goods, and which margin varies more it depends on the elasticity of substitution when trade costs change: a higher elasticity of substitution *magnifies* the sensitivity of the *intensive* margin to changes in trade barriers and it *decreases* the impact of the *extensive* margin (*i.e.*, trade flows are less sensitive to trade barriers when goods are more substitutable). Chaney also proved that, when the distribution of productivity across firms is assumed to be a Pareto, the effect on the extensive margin has a greater magnitude than on the intensive one.

But Chaney's analysis does not include a precise computation of the number of varieties made available by a freer trade - number of varieties that, in any case, in his model follows the standard pro-variety effect - and depends on the variation of the elasticity of substitution among goods for consumers where instead the Baldwin-Forslid model is a completely static model in which simple derivatives (or proportional changes) are computed holding everything else equal fixed.

Moreover, the anti-variety effect does not emerge in the Chaney model since there are many deep different assumptions that divide his model from the one of Baldwin and Forslid, *e.g.* the inclusion of a gravity equation to determine the trade pattern of the countries and the fact that there is a number N of nations involved instead of just two. The gravity equation adopted by Chaney determines the reciprocal influence that nations have one with each others and clearly heavily influences the results of the model.

So, the Chaney model of course touched many relevant points underlined also by Baldwin and Forslid, included the assumption of a homogeneous industrial sector, but does not implement that precise and complete characterization of an extended Melitz model as Baldwin and Forslid instead have done, characterization in which the features of the Pareto distribution actually play a key role for the delivering of the anti-variety effect.

Anyway, since in the Pareto distribution the shape parameter describes the "degree of concentration" of the distribution (the smaller it is, the heavier will be the tail of the distribution, *i.e.:* the proportion of firms with a relatively high efficiency), the selection of its value, so, may heavily influence the outcomes of the model.

The results offered by Baldwin and Forslid, however, clearly go in the direction of a negative impact of the extensive margin (*i.e.*: the variation in the number of new varieties available) of international trade, even if a pro-variety effect is actually present for the bigger nation after some level of trade openness (but the same does not hold for the small country).

The results offered by the Chaney model, however, are not necessarily in complete contrast with the outcomes of the Baldwin-Forslid model, since the formers tell us how trade margins react with respect different elasticities of substitution (a lower elasticity means an higher impact on the extensive margin since new, less productive entrants - that can enter in the global market thanks to new trade liberalizations - can conquer a significant share of the market, and *viceversa*). The Chaney model better specifies the quality of the trade flows thanks to its good analysis of

trade margins, and then can be considered only an extension (even if a very relevant extension) to the Melitz model - that in turn can be seen as particular case with heterogeneity of the general Krugman model, as underlined by Simonovska and Waugh (2014, see References and also the II chapter) - but with the inclusion of a gravity equation, a theoretical approach do not implemented in both Krugman and Melitz papers.

Instead, the Baldwin-Forslid model implements the Melitz model with first, the strong assumption of a perfectly competitive sector that is of course really useful to the aim of the paper but anyway constitutes a strong and unrealistic assumption, and second, the inclusion of a specific characterization of firms' efficiency embodied by the Pareto distribution, an assumptions that strongly influence the "quantitative" outcomes of the model, outcomes that are the core of the results offered by Baldwin and Forslid.

Indeed, an interesting feature of the Baldwin-Forslid model is its approach that can be considered both qualitative but also, for some aspects, quantitative, while the Chaney model is based merely on a theoretical, qualitative approach.

Anyway, the computations regarding the variation of the worldwide $\boldsymbol{V^w}$ exports with respect $\boldsymbol{\Omega}$ allows us to make a consideration about trade margins also in the Baldwin-Forslid model: the anti-variety effect means that we have a negative impact of trade liberalizations on the extensive margin of trade, while the fact that $\boldsymbol{V^w}$ increases tells us that the intensive margin of trade increases as consequences of a freer trade.

An other last fact comes out in favor of the practical use of the Pareto distribution to implement the Melitz model in the way Baldwin and Forslid have done: it seems to fit very well with a framework based on a CES utility-function.

We have seen, in fact, how the shaper parameter k directly affects the cut-off marginal costs $c_{d,x}$ (and so, the efficiency of a firm; see equation (VIII)) and, through β , the weighted average ω of the marginal costs (expression (VI)) and both the figures of produced and consumed varieties in a nation (see equations (VII) and (IX)).

But all the scriptures of the Baldwin-Forslid model are at the end of the day tractable and, more important, quite easy to understand, showing that the assumption of the Pareto distribution does not alter the analysis and leaves relatively tractable the model.

On the fixed costs. Moreover, I think it is crucial the multiple formulation of the fixed costs proposed by Baldwin and Forslid. In the fundamental work of Melitz (2003), we find just one, overall type of fixed cost that firms must bear *to produce a new variety* (our f_i, the fixed innovation-cost). Instead, here we have that this general fixed entry-cost for the innovation of a new good is integrated with two other *specific* types of fixed costs that each firm must bear: one, f_d, in order to *enter* in its *national* market, and the other, f_x, to *export* its production once it has bear the initial fixed cost f_i for the innovation of its own, new variety.

Those two "new" fixed costs added by Baldwin and Forslid modify the scenario Melitz proposed with his paper of 2003; in the Baldwin-Forslid model, in fact, firms must face beach-head fixed costs that are actually present in real life and that can be bear just by the most efficient

firms: who is able to bear these costs can erase foreign and local competition both in domestic and overseas markets.

The "accumulation" of fixed-costs creates a situation in which only the most efficient fraction of the relatively efficient firms can export, and the productivity of this fraction is relatively so high that its exploiting of economies of scale through international trade cancels out the relatively inefficient competition, with such a magnitude that the total number of varieties decreases (*e.g.*: each new McDonald fast-food eliminates 1,1 old restaurants, each new Hyundai model erases a fraction of the market-share of a Fiat model, each new Costa coffee-shop pushes out of business a traditional café).

On the anti-variety effect. The anti-variety effect, seen as the domestic consequence of a competition brought by those foreign firms able to exploit economies of scale at international level, is not counterintuitive: it is clear that bigger corporation can exploit those increasing returns that smaller one cannot; in real life, the only way to survive for smaller entrepreneurs is to offer an unique product at the right price.

In simplified scenarios as the ones modeled by economic researchers, with monopolistic competition and a bunch of products that are nor perfect complements nor perfects substitutes, product-variety is of course fostered, but at the same time generates, through economies of scale, the weapon to "decrease itself" since - *ceteris paribus* - each efficient, bigger firm (*e.g.:* McDonald) can actually substitute more than one single local producer of food-services through exploitation of economies of scale (if we think, for example, to the London city-center, the total number of McDonald, Subways and Pret restaurants is incredible, let say one thousand: without their presence, would we actually have one thousand of "independent" restaurant? The same can be thought about Starbucks and Costa. Of course there are precise business choices under this huge density of multinational restaurants, choices made available actually by the exploitation of increasing returns; in fact, some of those restaurants may even suffer losses, but these negative profits can be bear by the company that wants to have anyway a presence in that precise place to defend its overall commercial image).[116]

But it also out of doubt that globalization and the development of international trade have actually raised the number of available varieties for many categories of product, in clear contrast with the outcomes of the Baldwin-Forslid model. So, it is possible to argue that perhaps it exists a boundary level of economies of scale under which incumbent firms may be pushed out of the market by more efficient entrants: it would be the case of the single, independent restaurant or hotel fighting against a multinational company like McDonald or Holiday Inn. A the same time, over that "scale economies-benchmark", an incumbent will be sufficiently big ("too big to fail") to withstand the new competitors, limiting its losses to a fraction of its market share: it would be the case of Fiat against Toyota or Hyundai, just to make an easy example.

116 An article reported by *Wall Street Italia* on February, 28th 2012 ("*Irlanda: Dopo la Crisi del Debito quella dei Pub, Uno ogni Due Giorni Chiude*", originally edited by *Irish Time*) shows how in Ireland, the economic crisis has heavily hit the pubs of the country. In England, the 60.100 existing pubs in 2002 were only 49.400 in 2012 ("*«Chiuso per Crisi». La Gran Bretagna Dice Addio al Pub*", from *La Stampa*, August, 17th 2014).

However, as Baldwin and Forslid demonstrated following the steps of Melitz, society will anyway benefit of a gain in welfare, since the positive welfare improvement due to the lower prices offered by the incumbent firms is higher than the decrease of welfare due to the loss of varieties.

Nevertheless, I want to stress the point that in the Baldwin-Forslid model the *pro-variety* effect is anyway actually present, even if it emerges only in the asymmetric scenario (that is the one of interest, indeed) and only for the bigger country after a certain value of Ω, for both produced and consumed varieties (see Figures III and IV); the smaller nation, instead, in this model will always suffer of a decrease in variety, in both senses, since the home-market effect originated in the bigger country dominates the attempts of the smaller nation to diversify its industrial sector. The Baldwin-Forslid model, so, does not go completely against the standard trade theory, discrediting the models based on the concept of "love-for-variety" and that show how a pro-variety effect is the consequence of international trade.

So, reasoning from the entrepreneur point of view, if I am able to satisfy the first fundamental condition of introducing a new variety into the market (*i.e.*, I can bear f_i), the key-factor for the success of my corporation then will be my productivity: that is, am I able to produce a *new* variety in a *relatively* efficient (relatively to all the other efficient firms) way? If I am, then I will benefit of sure profits even exploiting the possibilities that foreign markets may offer (industrial fixed and marginal trade costs, anyway, will be somehow always present, acting as "natural" protectionist barriers); if I am not, than I will survive only in the local market, with really higher chances to be pushed out of my domestic market by new relatively more efficient national and foreign entrants, or at least facing a loss in my revenues due to them.

In real life, we know that products sometimes may be even perfect substitutes, so the question would become: am I able to produce the same *old* variety in a *more* efficient (with respect the incumbent) way?

Both these last two cases, one strictly theoretical (the first), and one that can not be included in the monopolistic competition model (the second) since all varieties must be slightly different, constitute two crucial challenges for any firm in our modern globalized world, both in theory and in practice, particularly for those firms that are located in those countries, like the our, that are still fighting against the many troubles and negative circumstances that are emerged during these years of economic recession.

Conclusion

What we have seen through these pages is that economic research follows the same trends that characterize real life, since economics is a social science (the "dismal" science, to use the words of Thomas Carlyle) that finds its origins, its scope of investigation and its final aim in the human being and behavior; and particularly, the field of study embodied by international trade and by the commercial relationships among nations is undoubtedly a central area of interest for economic research, a scope that probably does not arouse an odd interest in the most part of the people but that however, directly or indirectly, affects and will affect all our lifes and anyway exercises a great fascination on some people, both for its theoretical causes and its practical consequences.

The basic intuition and the further evolution of the monopolistic competition theory reflects this aspect of economics' nature: this theory is the theoretical answer (or "supply") to the theoretical need ("demand") of a new market-structure able to go beyond all the conceptual and technical limitations of the perfect competition and monopoly models; and was not by chance that this intuition for the monopolistic competition was born in a period of big material and human struggles and of careful considerations about the real knowledge and mastery of the economic science as the Great Depression was.

Indeed, through this work we have seen how the evolution of the economic trends clearly influence the economic research, from the origin till nowadays. For example, a recent article by Andrew Salmon published for the World Economic Forum[116] highlines how, in those years of negative or at least not shiny at all economic performances in which the negotiations for the WTO are almost stalled, countries tend to stipulate bilateral or regional trade agreement, and how the growth of really large nations like China and India is changing the pattern of international transports.

We have seen, in fact, how international trade theory has received a great boost in these last years mainly with works like the ones of Melitz in 2003 and of Eaton and Kortum in 2002 (but is also due to remember the recent contributions of researchers as Arkolakis, Zhelobodko,

116 Salmon, A., *The Word's Changing Trade Patterns*, for the *Word Economic Forum*, December 5th, 2014.

Bertoletti, Etro, Simonovska, Chaney, Behrens and Baldwin, just to quote some names), but it is also clear how an ultimate "direction" of research, a common general theory of international trade is far to be reached: we still can see, in fact, how theoretical investigation in this field goes in two directions, that respectively are the "exploitation" of the concept of external economies of scale and the concept originally given by Ricardo of comparative advantage, by which the reasons for and the gains form trade lie in the *relative*, and not absolute, technological advantage of a country with respect an other one, relative advantage that is reflected in different wages (that is, a sort of pricing-to-market effect); the winning idea of the Ricardian model is that different countries are actually specialized in different verities (in particular regarding traditional artisan and agricultural productions). But it also true that the model of monopolistic competition fits really well the features of the modern industrial organization, and gives also the chance of modeling the concept of increasing returns, a sure characteristic of the productive (not only merely industrial) companies and that can explain both pricing-to-market and home-market effects, and that nowadays a country can easily learn how to produce a new variety in which it was not previously specialized adopting new technologies, in a process that in our globalized word becomes every day easier and easier.

International trade theory, so, is far from a clear and all-embracing model that would be able to explain exhaustively both reasons and consequences of the global trade among nations; the same Baldwin-Forslid model we have seen delivers some results that are in contrast with the standard theory based on the monopolistically competitive market structure just with a couple of assumptions that are not completely rejectable.

Who is right, then, in the dissertation about international trade?

Time and dedicated research hopefully will give us the answer, day after day, contribution after contribution.

Appendix
Spence 1976

In this short appendix some interesting results highlighted by Michael Spence in his work of 1976 *Product Differentiation and Welfare* are briefly illustrated (see References for details).

Spence moved some important steps in the field of monopolistic competition in the 1975 and 1976; with the second of these ones, he expressed the consideration that there is always a trade-off between total output and number of varieties made in an economy modeled as a monopolistically competitive system (or also a market-structure that exhibits "product-differentiation" or "product-selection").

Spence touched indeed the case of the falling average costs, pointing out the important fact that, even if *MC* are under *AC* curve in monopolistic competition, and the latter decline up to the former, is *not* true that there are *too many* varieties; the nature of the model does not impose that profits must be equal zero for the first or the second best. So Spence concluded that profits may also be negative, but that the optimal number of products it is not necessarily zero: this happens clearly in the case of *AC* that decline indefinitely.

Then Spence debated the case of what he calls "biases" among goods, illustrating how profits and consumer's surplus may vary for products with different elasticities, and then how a good with a lower elasticity with respect another one may brings higher net surplus and lower profits, with the effect for an economy of loosing goods with low elasticity and to be biased in favor of the production of higher-elasticity goods. But, he stated, what matter is not the mere elasticity, but the slice of (potential) surplus that a firm is able to catch. Spence concluded that this case must be seen with caution as a special one in which some goods may not be supplied by the market (see **Figure A** and **B** for the replies of his graphical representation: **Product 1** has lower surplus and higher profits, but with a bigger fix-cost component the first one may survive, the second does not, even if it contributes more to the surplus).

The last part of the paper of 1976 by Spence I want to report concerns interactions between imperfect substitutes, and how new products can reach both gains (in profits and surplus) but also bring losses (with respect old varieties), and how the measure of these consequences

depends from their cross-elasticity: Spence quoted also a previous work of Dixit and Stiglitz (that is, at the end of the day, the mathematical basis of the future *Monopolistic Competition and Optimum Product Diversity* of 1977, published in 1974 for the Institutes of Mathematical Studies in the Social Sciences) to underline how monopolistic competition is the economical environment with qualitative features that ensure maximum products variability (and then surplus) with also positive profits for firms.

As Dixit and Stiglitz in their model of 1977, Spence too had already stated that "*equilibrium* and second-best [the constrained optimum in D-S] can coincide", and they actually do.

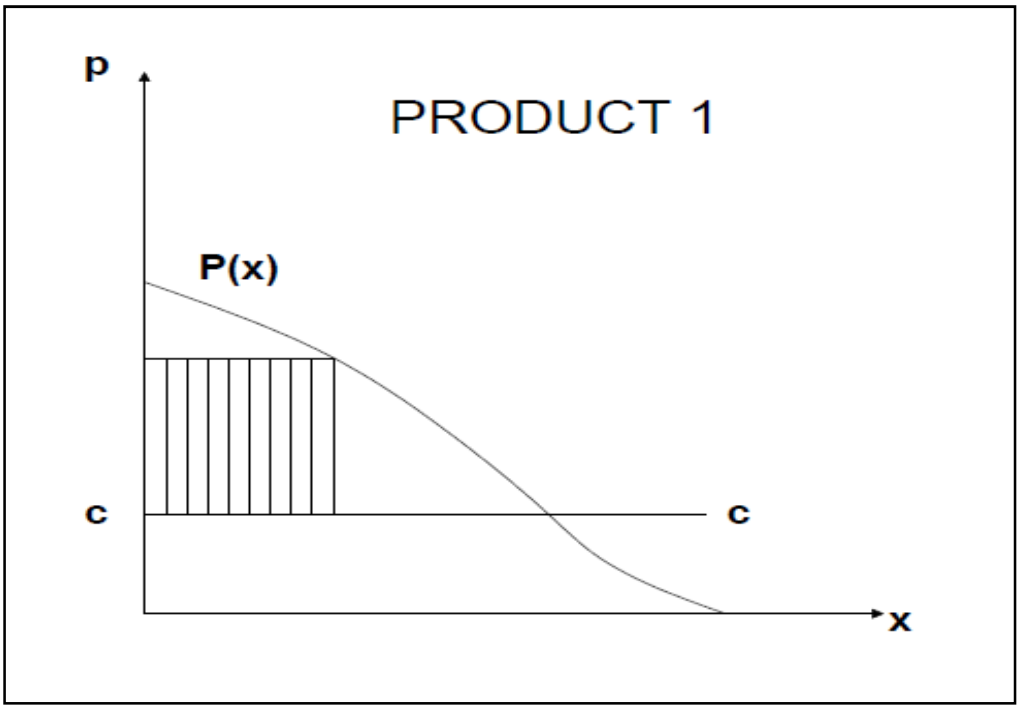

Figure A - The Product has Lower Surplus, Higher Profits, but May Survive to an Increase in Fixed Costs

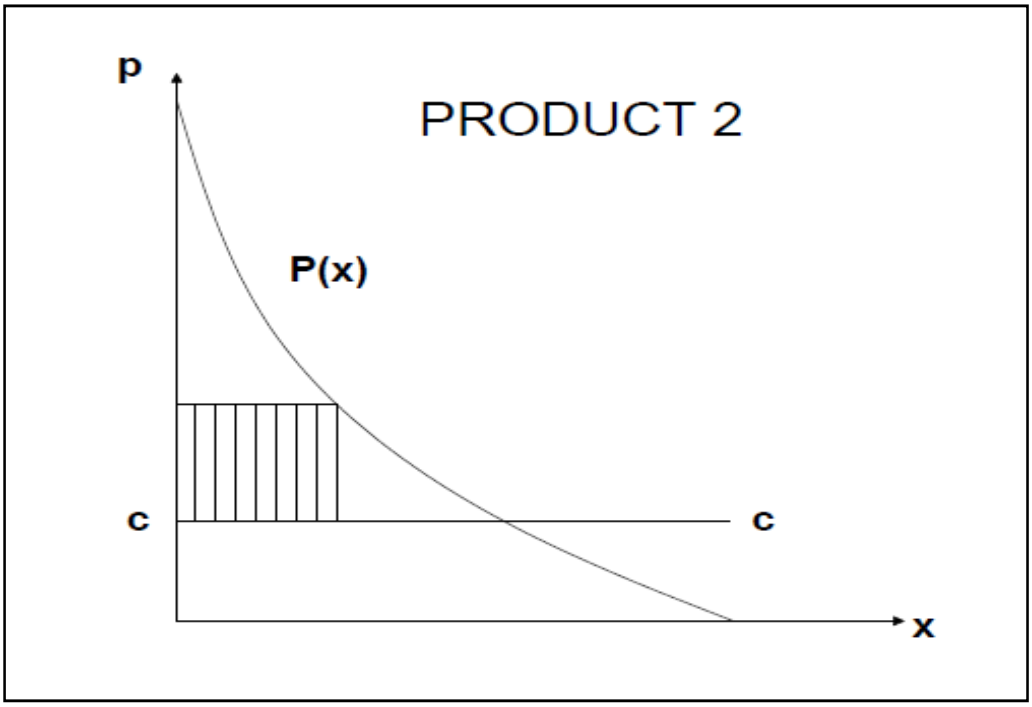

Figure B - This Product with Higher Relative Welfare May Disappear with Higher Fixed Costs

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