



Graduate School of Development Studies

**The conceptualization of capital and the  
nakedness of neoclassical theory**

A Research Paper presented by:

*María del Carmen Suárez*  
(Ecuador)

in partial fulfilment of the requirements for obtaining the degree of  
MASTERS OF ARTS IN DEVELOPMENT STUDIES

Specialization:  
**International Political Economy and Development  
(IPED)**

Members of the examining committee:

Dr. Howard Nicholas  
Dr. Andrew Fischer

The Hague, The Netherlands  
November, 2009

*Disclaimer:*

This document represents part of the author's study programme while at the Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

Research papers are not made available for circulation outside of the Institute.

*Inquiries:*

Postal address:           Institute of Social Studies  
                                  P.O. Box 29776  
                                  2502 LT The Hague  
                                  The Netherlands

Location:                 Kortenaerkade 12  
                                  2518 AX The Hague  
                                  The Netherlands

Telephone:               +31 70 426 0460

Fax:                       +31 70 426 0799

# Contents

<b>Chapter 1</b>	<b>Introduction</b>	<b>1</b>
<b>Chapter 2</b>	<b>Theoretical Framework</b>	<b>3</b>
2.1	Introduction	3
2.2	Who are the neoclassicals	4
2.3	The so-called capital controversies	5
2.4	Modern neoclassical perspectives	8
	Walrasians	8
	Austrians	9
	New Keynesians	10
2.5	Concluding remarks	12
<b>Chapter 3</b>	<b>Economic Growth and the Conceptualization of Capital</b>	<b>13</b>
3.1	Introduction	13
3.2	General theories of economic growth	14
	The classic Solow model	14
	New growth models	15
3.3	Case studies	17
	East Asia	18
	Africa	20
	A world perspective	21
3.4	Concluding remarks	22
<b>Chapter 4</b>	<b>Comparative Advantage Theory and the Conceptualization of Capital</b>	<b>24</b>
4.1	Introduction	24
4.2	Comparative advantage: a historical recount	25
	The classic theory of comparative advantage	25
	Heckscher-Ohlin model	25
	Heckscher-Ohlin-Samuelson model	26
4.3	Current perspectives	27
	Paul Samuelson revisited	27
	Ronald Findlay	27
	Paul Krugman	28
	James Harrigan	29
4.4	Applied perspectives	30

Anne Krueger	30
Multi-cone models	30
The GTAP	32
The World Bank growth report	33
4.5 Concluding remarks	33
<b>Chapter 5 Conclusion</b>	<b>35</b>
Notes	37
References	38

## **Abstract**

This research shows that in the last twenty to thirty years, capital in neoclassical theory has been conceptualized in a voluntaristic and self-referential way. This has served to define incongruous policies and recommendations in developing countries. By looking at the conceptualizations of capital that emerged in neoclassical theory after the Cambridge controversies and focusing on two crucial topics to development studies within that paradigm: economic growth theory and comparative advantage theory, this research gives a recount of the ambiguous and voluntaristic conceptualizations that have been made in theory and policy related literature. It concludes that the lack of a sound conceptualization of capital evidences the instability of the neoclassical school, which should open the possibility to redefine economic policies in development studies.

## **Keywords**

Capital conceptualization, neoclassical economics, economic growth theory, comparative advantage theory, development economics.

*“Indeed, it takes a foolhardy young soul to jeopardize a hard-earned career path in pursuit of the truth status of one or more of the meta-axioms which allow the profession to flood the journals with mathematical models that are so highly regarded and so little discussed. And as is so often the case with dominant paradigms, self-censorship is the predominant vehicle for neoclassicism’s unimpeded march” (Arnsperger and Varoufakis 2008: 22)*

## **Acknowledgements**

I am thankful to my supervisor, Howard Nicholas for his generosity in sharing his knowledge and guiding me through the convoluted world of economic thought, and for pushing me to think harder and deeper about many of the issues that directly relate to the reality of developing countries. To my second reader, Andrew Fischer for his enthusiasm in this topic and his helpful comments and suggestions. To Jorge for his love and patience, and for helping me realize what is important in life and choosing to share his with me. To my family for their endless loving support, especially to my mother. To the many friends and professors at the ISS and elsewhere who have contributed to this academic experience in one way or another. A scholarship from NUFFIC made my studies possible, their financial assistance is gracefully recognized.

# Chapter 1

## Introduction

There is a children's story that tells of an invisible dress that could only be seen by the greatest minds and people of the most extraordinary character. Its wonderful properties, beautiful colours and elaborate patterns were only visible to those fitted for the job. In Hans Christian Andersen's fairytale *The Emperor's New Clothes* the emperor, his prestigious court and the entire village were fooled by a couple of wise weavers. In my story, the concept of capital is reminiscent of that beautiful invisible dress and its weaving can be traced back over a hundred years. The making of such an elaborate piece has required an entire community of thinkers that have developed the most enlightened and knowledgeable techniques to convince anyone that there are indeed beautiful colours and wonderful properties concealed underneath sophisticated mathematical models and endless intricate assumptions.

The collapse of the American capitalism in 2008 is the child's voice saying that the emperor is actually wearing no clothes. It is like asserting that capital does not have a conceptualization, and that seems inconceivable. However, that voice echoes many others, who have asked before why we continue to build on it, why weave if there is no cloth and there is no thread. Not only within the academic community have scholars –probably a minority, been raising their voices but mainly every one of those individuals, particularly in developing countries, who were told and made believe that the outcomes of the weaving would be “Magnificent! Charming! Excellent!” but have all along been silenced because they were thought ‘unfitted’ for the job.

This research is an attempt to elucidate on the failures and contradictions in conceptualizing capital within neoclassical economics in an unambiguous and conclusive manner, and on the effects this has on the prescription of policies and recommendations to developing countries in a *capital-istic* context. This rather short study illustrates a few instances where the conceptualization of capital has been treated in voluntaristic and self-referential ways both at the theoretical level as well as at the practical level. I have chosen a neoclassical perspective because it has been the main interlocutor of economic knowledge during the past century and because they have built conceptualizations of capital emptied of the social issues at stake in economics (e.g. inequality, class, gender, ethnicity, etc) and based on incongruent modes of aggregation and measurement.

I have taken here an approach that evokes the ideas of an important philosopher of the 20<sup>th</sup> century, Ludwig Wittgenstein, who was also a close friend of Piero Sraffa, one of the greatest economists of the last century. For Wittgenstein, philosophy should not solve problems but dissolve them by

describing the rules that govern definitions within a language game. This is probably related to Sraffa's thoughts on the need to focus on the failing of capital theory in economics rather than on problems of measurement (Sraffa 1958). Today it seems that it is rather the latter that tries to solve the defects of the theory by concealing it under numerical fabrications. By unveiling the multiplicity of conceptualizations that are made throughout neoclassical literature it is possible to visualize what exactly Sraffa was referring to. This research takes this argument one step further by relating this theoretical failure to the policies advocated by the neoclassical paradigm in the name of development.

Starting from a recount of the important controversies that were raised during the 1950's through the 1970's, the next chapter establishes a theoretical framework that examines the conceptualizations of capital made by three different neoclassical sub-groups following these debates. This illustrates the instability of neoclassical theory and the difficulty they find in conceptualizing capital in unambiguous manner. In order to see how these conceptualizations have in turn played a role in other economic theories, mainly in the context of developing economies, two relevant topics are analyzed in the subsequent chapters: economic growth and comparative advantage theory.

The third chapter builds on the conceptualizations of capital that have been made in some of the most relevant analyses of neoclassical economic growth theory. Going back to the Solow model and reviewing a few of the new theories of growth, the chapter looks at the voluntaristic approaches made to the conceptualization of capital and how shifting definitions have been used at the theoretical level and particularly in policy recommendations made to developing countries with regards to this topic.

The fourth chapter briefly recounts the modifications of the original Ricardian model of comparative advantage by neoclassical authors leading to the Heckscher-Ohlin and Heckscher-Ohlin-Samuelson models. It then illustrates the use of various conceptualizations of capital by the main neoclassical authors in this topic with particular attention to the effects of these conceptualizations in the determination of development policies. The chapter evidences the theoretical inconsistencies that exist as well as the countless number of policy recommendations that can be made in the name of comparative advantage based on vague and ambiguous conceptualizations of capital. The last chapter concludes on the implications and consequences of these voluntaristic approaches within neoclassical theory.





*“We continue to build the destruction of the future,  
we apologize for the inconveniences” (author’s translation from Quino)*

## Chapter 2

### Theoretical Framework

#### 2.1 Introduction

This chapter introduces an analysis of the conceptualizations of capital that have been advanced by different schools of thought within the neoclassical perspective. This should allow the reader to visualize the vagueness and divergence of the concept in various subgroups of the neoclassical paradigm, which have shaped the way in which much of economics is explained. For this discussion I will use as a point of departure the outcomes of a well-known debate over the conceptualization of capital that took place during the 1950’s through the 1970’s between scholars in Cambridge, England and Cambridge, Massachusetts, which are known as ‘the Cambridge Capital’ controversies.

I will briefly summarize the elements of these debates that are relevant to this research as a way of introducing the conceptualizations of capital that emerged after those dialogues focusing on the views of three neoclassical subgroups: modern day Walrasians, Austrians and New Keynesians. First, I find it necessary to explain what neoclassical economics means as a prelude to the analysis of individual schools of thought within this paradigm. This will then be used in the remaining of this research to look at the relationship between these conceptualizations and development studies presented in the following chapters.

## 2.2 Who are the neoclassicals

The term neoclassical can be traced to the 1870's when the combination of the works of Leon Walras, Stanley Jevons and Carl Menger were combined under the 'marginalist writers' umbrella. Thorstein Veblen was first to coin it (Colander 2000: 131); however the complex evolution of neoclassical economics has always made it difficult to combine its adherents under one umbrella and at many points in time it has changed so much from its original meaning that it has been qualified as a 'death terminology' (Colander 2000), nonetheless it has continuously been used. There are certain characteristics that can be said to represent what is still commonly known today as neoclassical economic thinking.

In an effort to point the term 'neo-classical' as a 'misnomer' Tony Aspromourgos (1986) remarks two features of the neoclassical paradigm that clearly distinguish it. He argues that neoclassical thinking is based on a 'subjectivisation of costs' and the 'individualistic method' to which Hicks referred to –taking from Hayek's definition<sup>1</sup>, as "the greatest asset of neo-classical economics" (1986: 266-268). In the same vein, Bob Rowthorn (1974) attributed the characteristics of "individualist, and subjectivist" to neoclassical economics –although he refers to it as Marx did calling it the 'vulgar economy' (1974: 63). Following their lead, I take neoclassical in this research to mean a paradigm rooted in the subjective preference theory of value and the notion of methodological individualism.

The first characteristic that defines neoclassical economics then is a subjective preference theory of value. By this we mean that price is explained by the subjective evaluation of individuals; by the utility they derive from the consumption of something. *Utility* is the subjective evaluation of a consumable thing, bundle of things or a set of circumstances in which a person may be placed (Alec Gee 1991: 75). For neoclassicals utility is the source of *value* of goods and services and thus what determines the value of their exchange. This is a very different stance from that of the Classical economists for whom value was derived from the costs of production mainly in terms of labor.

The second characteristic is the notion of methodological individualism. The idea behind it is that there are, what Sue Himmeltwit (1977) calls 'basic units of analysis' (either people or firms), which act as the building blocks of the economy. She goes on to explain how these economic agents act together in order to maximize something –be it income, profit or utility (1977: 22). Thus in order for a person to maximize his or her utility, each individual formulates a cost-benefit analysis that allows him or her to make choices according to individual preferences. Furthermore for neoclassicals individuals' choices translate into society's choices under the auspice of the market. Thus individual behaviors are preference-driven and have as ultimate goal the maximization of satisfaction.

Under the umbrella of the neoclassical school we can find today a number of sub-schools of thought. Three of the most important of these, and the ones chosen as the focus for the present study, are modern Walrasians, Austrians and New-Keynesians. However we first turn to previous debates on the conceptualization of capital -specifically the Cambridge controversies since they will allow us to understand the conditions under which the current conceptualizations of capital have taken place. These conceptualizations will in turn be used to study their relationship to development policies.

### 2.3 The so-called capital controversies

In the 1950's and through the 1970's many prominent scholars pointed out to problems of accumulation and measurement of heterogeneous capital goods. Questioning the conceptualization of capital in the Cambridge debates was part of a critic to the neoclassical aggregate production function where capital was seen as a variable that could be used to explain the difference between people who received wages and people who received profits in a capitalist economy, since by taking labor and capital as 'given stocks' the respective marginal productivities could also be determined<sup>2</sup> (Harcourt 1972: 15-16). This visualization of capital as a unified category that could be aggregated individually of the heterogeneity of the many goods that go into a production process brought some economists to question the neoclassical perspective. Joan Robinson was one of the pioneers. One of her well-known paragraphs about the neoclassical production function states that it is,

“a powerful instrument of mis-education. The student of economic theory is taught to write  $O = f(L, C)$  where  $L$  is a quantity of labour,  $C$  a quantity of capital and  $O$  a rate of output of commodities. He is instructed to assume all workers alike, and to measure  $L$  in man-hours of labour; he is told something about the index-number problem involved in choosing a unit of output; and then he is hurried on to the next question in the hope that he will forget to ask in what units  $C$  is measured” (J. Robinson 1953-1954: 81).

For Joan Robinson and other economists at Cambridge, England the unit of measurement of capital was a clear point of disagreement with neoclassical economists in Cambridge, Massachusetts. In the case of the 'one-commodity production function' this is not an inconvenient since capital can be measured in the same units when it is the only input used and it produces only one kind of output that in turn becomes the input again. However in a more realistic setting where there are a large number of heterogeneous capital goods that interact as inputs to production it becomes much more difficult to measure them -and even more so to aggregate them under one category, 'capital', as if they were all alike. Thus Steve Keen's assertion,

“[t]he only thing that such disparate commodities obviously have in common is a price, and this is how economists would prefer to aggregate capital. But the price of a piece of capital should depend on the rate of profit, and the rate of profit will vary as prices change: there is an impossible circularity in this method of aggregation” (Keen 2001: 137).

In order to make this point very clear it is necessary to take a step back. Keen’s argument follows Piero Sraffa’s critic of the neoclassical production function, explicitly here on the obtainment of the rate of profit as the marginal productivity of capital. Sraffa was another of the scholars at Cambridge, England involved in the capital debates and for him,

“The difficulty cannot be overcome by allotting the surplus before the [relative] prices are determined, as is done with the replacement of raw materials, subsistence, etc. This is because the surplus (or profit) must be distributed in proportion to the means of production (or capital) advances in each industry; and such a proportion between two aggregates of heterogeneous goods (in other words, the rate of profit) cannot be determined before we know the [relative] prices of the goods. On the other hand, we cannot defer the allotment of the surplus till after the [relative] prices are known, for, as we shall see, the [relative] prices cannot be determined before knowing the rate of profits. The result is that the distribution of the surplus must be determined through the same mechanism and at the same time as are the [relative] prices of commodities” (Sraffa 1960: 6).

What we should understand from Sraffa in this paragraph is that if each of the physical goods assumed under the category of ‘capital’ is valued on a monetary equivalent, the argument falls in a circular explanation. Whenever we are not speaking of raw materials we are referring to other produced physical things that have different layers of production where prices change in dissimilar ways<sup>3</sup>. Sraffa pointed out to the fact that the rate of profit is already a component of the monetary valuation of each of these heterogeneous capital goods, in which case ‘capital’ as a category cannot also serve to define the rate of profit as neoclassical theory intends to do because profit has already been accounted for. This was part of a more extensive and elaborate argument on the differences of return workers get vis-à-vis capitalists -but which is beyond the scope of this essay; however what has been advanced here helps us understand why the previous conceptualization of capital in the neoclassical aggregate production function would fail outside the extreme case of a single-commodity world.

Then as we can see from the above-mentioned authors, the assumption of capital as either a category that includes multiple heterogeneous goods or a sum of monetary value that lumps them all into one, is highly problematic to say the least. These were some of the main topics set forth by the Cambridge, England scholars and which went on for almost twenty years between them and their counterparts at the Massachusetts Institute of Technology (MIT) in

Cambridge, USA. Off course MIT scholars did not remain silent to these debates.

According to Cohen and Harcourt (2003) there were three explicit theoretical responses from Cambridge, Massachusetts. Swan in 1956 used a category called the ‘putty capital’ which at the end attempted to ‘collapse capital into a one all-purpose commodity’ and thus inevitably presented no real solution; the Solow approach in 1963, tried to avoid ‘problems of capital by focusing on the rate of return on investment’ and used empirical estimates of rates of return in actual economies to explain growth in the economy, but as we will see in the next chapter, that approach also presented some shortcomings; and Samuelson in 1960 with a ‘surrogate production function’ which “included what appeared to be a variety of physically distinct capital goods, but he also assumed equal factor proportions in all industries, making relative prices independent of changes in distribution between wages and profits. As Samuelson subsequently realized, this effectively collapsed his model back to one commodity” (2003: 205-206).

As a result there was acknowledgement of defeat on the part of the Cambridge, Massachusetts side as Edwin Burmeister, a neoclassical scholar himself, describes it.

“The damage was done and Cambridge, UK, ‘declared victory’: Levhari was wrong, Samuelson was wrong, Solow was wrong, MIT was wrong and therefore neoclassical economics was wrong. As a result there are some groups of economists who have abandoned neoclassical economics for their own refinements of classical economics. In the United States, on the other hand, mainstream economics goes on as if the controversy had never occurred. Macroeconomics textbooks discuss ‘capital’ as if it were a well-defined concept –which it is not, except in a very special one-capital-good world [...] The problem of heterogeneous capital goods have also been ignored in the ‘rational expectations revolution’ and in virtually all econometric work” (Burmeister 2000: 310).

We conclude here the analysis of the capital controversies that took place during the 1950’s through 1970’s and which shaped the way in which capital is understood today. At this point we can turn to an individual analysis of three schools of thought within neoclassical economics with regards to their views on the conceptualization of capital. For this purpose we look at modern day Walrasians, Austrians and New-Keynesians particularly after the Cambridge debates. Though it is important to note at this point that as Burmeister has already recognized some schools of thought have not been persuaded by the outcomes of those debates and continue to rely on already demonstrated problematic concepts of capital. Their individual reinterpretation will be the backdrop of the remaining chapters.

## 2.4 Modern neoclassical perspectives

As a result of past debates there have been increasing fragmentations within the understanding of the conceptualization of capital in neoclassical economics. Some of the schools of thought within it have attempted to redefine it completely while others have designed ways of working around the controversies. Here are summarized a few of the transformations in the conceptualization of capital that arose afterwards.

### *Walrasians*

The first school we turn to are modern day Walrasians who are seen as followers of Leon Walras' original ideas of an economy where decisions in a competitive environment and in the absence of interferences with the market are pre-coordinated through a price system where markets tend to clear (Sawyer 1989: 1). This school of thought is part of the neoclassical schools that attempted to solve the problems of aggregation or measurement by assuming them away and retreating to standard neoclassical results. As Vivian Walsh (1997) points out, one way to do that was through initial *assumptions* that ruled out the nuisances to start with.

However the problem on the conceptualization of capital, even in unrealistic equilibrium conditions, cannot be 'solved' by a monetary valuation since, as Alfredo Medio (1977) asserts, in general equilibrium theory "no attempt is made to measure 'capital' independently of prices. Instead each individual item of the collection of capital-goods is measured in its own technical unit". Then it follows that, the concept of 'capital in general' or 'marginal productivity of capital', has no "essential analytical role" (1977: 385). This then prevents them from explaining the rate of profit as a return to capital –since there is no homogenous entity called 'capital'. In that scenario the rate of profit cannot be determined independently from the rate of interest.

Another example of this 'solution by omission' type of analysis is David Kreps' (1990) microeconomic textbook. He uses, almost apologetically, a general equilibrium analysis. However, seemingly aware of the problems this may create he carefully excludes the use of the word 'capital' (even from his book's index!) and never actually uses it to explain production or consumption. In a way it leads me to believe that he has done away with the concept, however looking at his conceptualization of profits –as a second attempt to understand his view of capital I find him clarifying -when explaining the necessary assumption of firms as 'profit maximizing entities', that "once we pass from a one-period, no-uncertainty world, into the world of uncertainty and many periods of economic activity, it isn't even clear what the term 'profit maximization' means [...] This makes sense (once again) only if the firms is a price-taker, where being a price-taker in this context entails many more conditions" (1990: 729). As we mentioned earlier, this school of thought is limited in its possible explanation of profits, which is probably why Kreps has

added this explanation, with regards to capital however it seems to me he is clearly aware of the problems it raises.

One last example is the capital description presented by a modern day Walrasian, Edwin Burmeister, who clearly recognized in his *Capital Theory and Dynamics* that,

“descriptive models of economic growth having heterogeneous capital goods often possess steady-state equilibria that exhibit saddlepoint instability<sup>4</sup>. In such cases, if we are given arbitrary initial stocks of the various capital goods, convergence to a steady-state equilibrium occurs only for very special choices of initial capital-good prices. Various mechanisms do allow us to select the ‘correct’ initial prices [...] none of these are satisfactory in an economically realistic framework” (Burmeister 1980: 261)

For modern Walrasians then, there appears to be a very restricted concept of capital with no possible aggregation of heterogeneous goods under the one category ‘capital’ or any of the other variations that presume it a homogeneous entity that can be measured, accumulated, stocked or analyzed in units. This will prove highly relevant in the following chapters.

### *Austrians*

Although to some it is a contested view to include the Austrian school within the neoclassical paradigm due to their rejection of the norm of equilibrium I am including them in the broad church of neoclassicism due to their subjective approach to the explanation of price and their methodological individualism. One of their most representative figures today is Steven Horwitz, who acknowledges the Austrian emphasis on subjectivism and stresses their views of the market as a ‘competitive discovery process’ rather than an environment tending towards general equilibrium (Horwitz 2000: 1). We can already notice that for this school of thought the set up is quite different than that of general equilibrium adherents in the modern Walrasian perspective and that the circumstances under which capital is defined would necessarily have to depart from that perspective.

Modern Austrians had to reconceptualize capital because their prior definition considered capital as “all auxiliaries to production with the exception of natural forces in their original form, and direct human labour” (Wicksell 1934 [1901]: 144-145). These auxiliaries were seen as ‘produced means of production’ but their heterogeneity was recognized as having “only one quality in common, namely that they represent certain quantities of exchange value, so that collectively they may be regarded as a single sum of value” (1934 [1901]: 144-145). Assuming that ‘capital’ could be accounted for as a homogeneous value derived from the returns to land and labor alone is precisely the critic that Sraffa made in his argument as it was previously explained. This led to a

necessary change of perspective on the conceptualization of capital in modern Austrians' literature.

Since modern Austrians define the market as an entity characterized by disequilibrium, an aggregation of capital as a homogeneous body would be impossible; it is rather their view that capital "cannot be defined in terms of the physical qualities of the object, but rather its purpose or role in the plans of its possessor". Furthermore he clarifies that this includes "non-material assets such as brand-name, goodwill, or information" just as much as any physical machinery (Horwitz 2000: 46). Thus capital is no longer material goods, but any input that is needed for the entrepreneur to achieve his or her production plans. This acute definition of capital is carefully intended to include all inputs used up in a *process* of production, which as Howard Nicholas asserts is a view rather reminiscent of Marx's conceptualization. As Nicholas further explains if we follow this argument there would be no logical reason to exclude labor as an 'input' since it too should have a place in the entrepreneur's plans. However Nicholas is careful to explain that if we extend this line of thinking, capital becomes a disequilibrium phenomenon, thus if the economy functions in an optimal way –as Austrians believe it can, and there is perfect information the entrepreneur as well as capital would cease to exist (Nicholas *Forthcoming*).

The drastically different conceptualization of capital of the modern Austrian school will in turn become very relevant in our analysis. At this point it is necessary to recapitulate that the Walrasian view does not present an economically realistic definition of capital and that the Austrian perspective includes everything that serves to fulfil a production process subjectively defined by an entrepreneur. This leads us to the final school of thought within our analysis.

### *New Keynesians*

The New-Keynesian perspective arose in the 1980's partly as an extension of the neoclassical synthesis school inaugurated by Paul Samuelson in the post-war period. As some of its main representatives have asserted, there is not a common set of economic and policy answers that economists in this tradition follow, but rather broad lines of analysis (Mankiw and Romer 1991). It is mainly devoted to providing '[neoclassical] microeconomic foundations for the central elements of Keynesian economics' (1991: 1). These broad lines of analysis are centered around ideas of market failures where it is assumed there are information asymmetries and agents do not have the necessary information and knowledge to make decisions that would adjust them automatically (Marcuzzo 2007); and the view on price 'stickiness', meaning that prices do not directly adjust, like in a Walrasian setting for example, since markets are inefficient (Rotheim 1998).

One of the simplest, most straightforward analysis of this school of thought can be done through various undergraduate and graduate level



textbooks where many of the main representatives of these schools have introduced the basic concepts underpinning New Keynesian views. In Gregory Mankiw's *Principles of Economics* (2004) we find the description of capital as "the stock of equipment and structures used for production. That is, the economy's capital represents the accumulation of goods produced in the past that are being used in the present to produce new goods and services" (2004: 404). Furthermore in order to explain the 'price' or the 'return' to capital, Mankiw goes back to an older conceptualization of capital. He assumes that supply and demand can determine the price of a factor of production, thus in the case of capital it is suppose to be paid its 'marginal return' (2004: 406). In doing this, he revisits an older Walrasian view of a perfectly competitive environment calling it the 'simplest assumption' one can make about the economy. This would assume capital to be a homogeneous category where all 'equipment and structures' can be measured and aggregated in the same units. This is precisely the definition from which modern Walrasians departed after the capital controversies. They had to redefine capital goods and accept that they could only be measured in their own individual technical units because it had been demonstrated that all other forms of defining it in the form of a single category were erroneous. However Mankiw uses it to express the 'simplest' form of an economy.

Mankiw adds a level of confusion by explaining that labor income is the paycheck workers get and that capital is actually owned by firms, who are profit-maximizing entities and are the ones who receive the earnings of that capital (2004: 406). He then explains that the earnings of capital income are later paid to households but in the form of interest (for example in your bank account). The problem of this distinction is that there are owners of capital who get profit and there are others who get interest, but there is no explanation of why this is different for each group. Specially since he assures us that the conclusion is the same and "capital is *always* paid according to the value of its marginal product" (2004: 406 emphasis added). But is that marginal product the profit firms get or is it the interest households receive? If it is *always* the same, then there would be no logic in calling them differently. The problem is that not only did modern Walrasians already disqualify part of this vision as highly unrealistic, but it also leaves us confused since we now truly do not know what capital means and even less how it receives a 'marginal return' in a textbook meant for first year college students!

Another New Keynesian author that helps to illustrate this school's views of the concept of capital is Paul Krugman. In his book *International Economics*, co-authored with Maurice Obstfeld, he introduces two alternative concepts of capital, one as a capital market where a "set of arrangements by which individuals and firms exchange money now for promises to pay in the future" (Krugman and Obstfeld 2003: 7); and a second one where capital is an input to production, which can be described as "vats used to brew beer or stamping presses used to build auto bodies", which although not substitutable for each other in the long run can be seen as "manifestations of a single, mobile factor

called capital” since investment can be redirected from one industry to the other (2003: 40).

It seems then, that in the New-Keynesian perspective capital can be seen as, investment, money, produced goods, and several other inputs depending on who owns it or how it is used. The problems that arise from this unstable conceptualizations of distinctively separate categories -as if they were naturally corresponding, becomes a concern not only at the theoretical level due to the ambiguity of the terminology and the confusions this creates, but also due to its varied use in other economic topics as well as development policies as it will soon be apparent.

## 2.5 Concluding remarks

This chapter has sought to show the divergent, vacuous and logically flawed conceptualizations of capital used by neoclassical economists at the level of general theory. It was suggested that part of the reason for the current divergence and vacuousness in defining capital is the logical flaws with traditional conceptualizations that the capital controversies highlighted, but which seem to be ignored in many modern conceptualizations which attempt to retain the basic theory of distribution which the neoclassical school subscribes to.

In summary, the Cambridge capital controversies pointed to the impossibility of reducing heterogeneous physical goods to a single homogeneous category called ‘capital’ that can seemingly accumulate and measure them regardless of their individual characteristics and modes of production. They showed the problematic consequences of measuring them in their relative prices or assuming that it is possible to make inferences of the relationships between ‘capital’ to ‘labor’ ratios or a ‘return’ to capital. It was noted that as a consequence of this the modern Walrasian school has moved away from a conceptualization of capital as a homogeneous entity and rather assumes capital to be any and every input where the rate of return in terms of itself is positive. The consequence is that this sub-school is left with a vacuous and operationally defunct conceptualization of capital.

It was also noted that as a consequence of the logical flaws with traditional conceptualizations of capital modern Austrians have sought to move down a different path, defining capital as any input that may be useful for the entrepreneur. This in turn accounts for anything that exists (material or immaterial) that can help the entrepreneur’s production process. Finally, it was noted that many neoclassicals belonging to the New Keynesian school appear to adopt quite varied conceptualizations of capital (including financial capital) many of which appear to be oblivious to the Cambridge debates and their results. The ambiguity of the definitions of capital will be the backdrop to the analyses of the following chapters.



*(Author's translation, originally in Spanish from pedrocartoons.blogspot.com)*

## Chapter 3

# Economic Growth and the Conceptualization of Capital

### 3.1 Introduction

As we saw in the previous chapter there is considerable ambiguity surrounding the conceptualization of capital, to say nothing of the theoretical problems many of these conceptualizations give rise to. One of the important consequences of this ambiguity is that it translates into a myriad of conceptualizations of capital in studies, which purport to explain real world phenomena, many of which pay little or no regard to the theoretical flaws underlying the conceptualization. This raises obvious questions about the scientific validity of these studies, and suggests that many of the conceptualizations are designed to yield predictable conclusions. One area where this is particularly evident is in the study of economic growth in developing countries.

There is an extensive body of literature available on the relationship between rapid economic growth and high development levels achieved by certain countries in the last fifty years (Loayza et al. 2005), (Lucas 2008 [1993]), (Rodrik and Subramanian 2005). Particular attention is given to the experiences of East Asia, Botswana, India, Brazil and China to name a few very successful stories, but there is increasingly more focus on how to transmit lessons from those countries to less flourishing economies. The intention of this chapter is to reflect on the ramifications of the different conceptualizations of capital on both, the theories that purport to explain the growth processes and the policy

conclusions that are derived from them. First we look at the conceptualization of capital used in some of the most prominent growth theories, and then we focus on the significance of the conceptualizations for the lessons drawn from the study of actual growth processes. As we will see the most often used conceptualizations of capital in explanations of economic growth are those advanced by the New Keynesian school of thought, conceptualizations which were shown to be quite varied, vague and logically flawed. Most disturbingly, it is these conceptualizations that are pivotal in studies deemed to be relevant for policy making in developing countries.

### 3.2 General theories of economic growth

Most of modern day economic growth literature can be traced back to the contributions of Robert Solow (1956) and what became popularly known as the ‘Solow Model’. This model held sway until the mid 1980s when it gave way to what is referred to in the literature as endogenous growth models, founded mainly on the works of Paul Romer (1986) and Robert Lucas (1988). I should note here that I am not interested in the theoretical distinctions between the older and newer growth models but rather only on the differences in their conceptualizations of capital –and the significance of these different conceptualizations. Accordingly, I begin this review of neoclassical theories of growth with a recount of the conceptualization of capital in Solow (1956) and then move onto conceptualizations of capital in the new theories of growth taking Romer (1986) as the beginning of the new growth theory and proceeding with Mankiw, Romer and Weil (1992). I have tried to focus on the most recognized authors of various growth approaches and I must clarify that I am not concern with measurements of growth *per se* or internal discussions between growth models; I am only interested in the way they each use the concept of capital in their explanations of growth patterns.

#### *The classic Solow model*

The Solow model represents a touchstone of growth theory. It has been widely appraised, used, criticized and more recently regenerated. As it has fulfilled such an important role in growth studies, I have included it here in order to use its founding principles, particularly its conceptualization of capital as a starting point in our analysis. Off course many of its shortcomings have been recognized by its supporters who have also participated in its regenerations, such is the case of Gregory Mankiw and others, discussed in the later part of this section. The Solow model of 1956 used a simple understanding of the economy assuming that a “single composite commodity is produced by labor and capital under the standard neoclassical conditions”. Solow further explained that the ‘community's stock of capital’ takes the form of ‘an accumulation of the composite commodity’ (1956: 66). In his initial growth model capital represents the amount of that single homogeneous commodity produced that is not consumed, but saved and reinvested.

Solow used a production function that analyzes inputs (labor -L and capital -K) only in terms of output (Y), and where labour is interchangeable with his homogeneous capital commodity. The production function that allowed him to do that was the Cobb-Douglas production function and many studies, particularly econometric analyses, are still done using this idea. The production function is described as,

$$Y = AK^{1-\alpha}L^\alpha \qquad 0 < \alpha < 1 \qquad [1]$$

Where  $A$  is a given level of technology and the rest as mentioned above. The main idea we need to keep in mind here is that  $K$  and  $L$  have diminishing marginal returns –meaning that there is a point where an extra ‘unit’ of any of the variable factors means smaller increases of output. Furthermore in neoclassical theory these variable factors receive a remuneration equal to their individual marginal product –in the case of capital the rate of profit is assumed to be that earning. These two characteristics combined are the reason why if “capital becomes relatively less scarce, the rate of profit declines and other factor prices, including the wage, rise” (Howard 1983: 104). This will become more relevant as more advanced analyses are done retaking this production function to try to determine actual world phenomena but based on this restricted conceptualization of capital.

For now we can move on to later economic growth models since as we pointed out in the previous chapter, capital when considered a single category –here ‘the composite commodity’, cannot accurately portray a production system where the input good rarely -if ever, produces -with no other input than labor, a unique output good that can be consumed, saved and reinvested becoming input again. The words advanced by Burmeister in the previous chapter already recognized the shortfalls of this conceptualization of capital thus we move on to later growth models and theories.

### *New growth models*

This section considers growth models that came about after the Cambridge controversies, thus assuming the authors were already familiar with the outcomes of these debates.

#### **Paul Romer**

Paul Romer advanced in 1986 a growth model that is still viewed as one to represent the new generation of models in growth theory. Romer’s basic idea is to depart from models that are looking at the endogenous accumulation of physical capital as an explanation of growth and are dismissing the possibility of endogenous accumulation of knowledge (Romer 1986). Romer attempts to elucidate on this gap in the 1986 and later models. The individual contributions of his model are beyond the scope of this research, but the conceptualization he makes of capital in his analysis is of great interest as it tries to distance itself

from previous conceptualizations particularly those that treat physical capital goods as perfect substitutes.

One example is Romer's text on *Endogenous Technological Change*, where he considers a one-sector neoclassical model in which durable goods can have separate effects on output when they are combined (Romer 1990: 81). Romer is well aware of the fact that heterogeneous capital inputs cannot be aggregated under a single category called 'capital'. However, he goes on to describe that "there is a distinct firm  $i$  for each durable good  $z$ ". This already starts to make things a bit more difficult because he is assuming that individual firms produce individual outputs but with no mention of the inputs (which are usually different) that go into the production of those  $z$ 's. He further explains that "[i]t is possible to exchange a *constant* number of consumption goods for each unit of capital goods if the production function used to manufacture capital goods has *exactly* the same functional form as the production function used to manufacture consumption goods" (1990: 81 emphasis added). In other words, Romer views capital as physical goods that enter a production cycle, but in his model there is only one-sector where there are single firms producing single goods made of no other inputs, which in turn can be moved from one production function to another but in *constant number*.

These restrictions are effectively the same as Samuelson's argument in favor of the surrogate production function where "there are a great variety of capital goods [... and] society produces only one kind of homogeneous final output, we can regard the use of each kind of physical capital good as a separate linear programming activity and can adhere to the most extreme assumption of *fixed-proportions*" (Samuelson 1962: 194 emphasis added). This was already discussed in the previous chapter as one of the 'solutions' presented by the neoclassical school in Cambridge, Massachusetts. Cohen and Harcourt point out specifically with regards to Samuelson's argument that the surrogate production function made "relative prices independent of changes in distribution between wages and profits [...] this effectively collapsed his model back into one commodity" (Cohen and Harcourt 2003: 206). The same happens with Romer's view of independent firms producing independent  $z$ 's that can only be exchanged in fixed amounts, we find ourselves with a proposition that deals with capital as heterogeneous goods but when combined they can *only* enter the production process in fixed proportions. This conceptualization of capital had already been proven problematic.

### **Gregory Mankiw, David Romer & David Weil**

The last model we analyze in this section is the one presented by Mankiw, Romer and Weil in 1992. The idea the authors had was to keep the basic Solow model assumptions of savings and population growth as the drivers (or barriers) of income growth, but also to account for human capital -and not only physical capital, in order to better predict the directions and magnitudes of the effects of savings and population growth (Mankiw et al. 1992). As we

are mainly interested on the conceptualization of capital I will not look at the additions and changes the authors undertake in order to explain growth, but only those that are pertinent to our analysis. Throughout the text there are various, rather puzzling, definitions of capital that are used to explain growth. In the first section, taking back from the Solow model, the authors explain that capital, like labor, is another input to production (1992: 409). They assume an augmented Cobb-Douglas production function,

$$Y_t = K_t^\alpha H_t^\beta A_t L_t^{1-\alpha-\beta} \quad [2]$$

Where  $Y$  is output,  $A$  the level of technology,  $H$  the stock of human capital,  $K$  capital, and  $L$  labor (1992: 420). However when they add human capital to the equation, they further assume that  $\alpha + \beta = 1$  and non-decreasing returns to factors (1992: 421). This assumes away labor and creates a model where variations of growth depend on either human or physical capital. However since they assert that “one unit of consumption can be transformed costlessly into either one unit of physical capital or one unit of human capital”<sup>5</sup> (1992: 416) then these two inputs should be measurable in the same units. In order to do this, the authors turn all values into monetary equivalences by using pre-existing data (1992: 431). This then assumes that physical capital are precisely those goods that the authors choose to include as a measure of what they believe accounts for a so-called ‘productive capital’.

Finally the authors discuss the predictions of the Solow model in international changes of rates of return and capital movements. In this section there is rising ambiguity with their conceptualization of capital. In order to speak of ‘international capital flows’ since they do not refer to actual physical goods, but rather to financial flows, they speak of the rate of return to it in terms of the interest rate, but in the next page they speak of the rate of return in terms of profit (Mankiw et al. 1992: 430-431). It is not clear when the authors are using capital as an input to production and when they have changed it to mean something else. The use of ‘return to capital’ as both interest rate and profit, as if they were interchangeable terminology, makes their analysis illogical and hardly suggests an inclusive understanding of economic growth in developing countries.

In order to illustrate how these rather confusing and vague conceptualizations of capital are applied to situations in different countries we move to the implementation of growth models such as the ones just analyzed, in development studies.

### 3.3 Case studies

More recent literature takes us through authors who have profited from the works of earlier growth theorists and whose focus is on more specific issues within growth analysis. In this section we turn to prominent scholars who have been closely involved in processes of development in less

economically advanced countries, some of them through international organizations while others have done it independently, but all technically interested on the advancement of these economies and its populations. What we find is a theoretical vacuum that has allowed for multiple conceptualizations of capital, many of which are drastically different from each other, and where much of the dissonance can be identified in the changing definitions that are used in models, policy analysis, policy prescriptions and data gathering.

### *East Asia*

Alwyn Young (1995) carries out an analysis looking at the case of East Asia's rapid growth. He explains how his research focuses on "two aggregate inputs, capital and labor" that he has subdivided into 'finer sub-input categories'. In the case of capital he has divided it "into five categories: residential buildings, nonresidential buildings, other durable structures, transport equipment, and machinery" (1995: 649). In order to aggregate them all under one category called 'capital' he uses prices collected from national accounting reports on the gross fixed capital formation (GFCF). Thus the concept is dependent on the individual prices of the goods used to 'measure capital' reducing all heterogeneous goods to monetary equivalences. He does this for all five categories of physical goods in order to explain how 'capital' has been accumulated and its relationship to economic growth in the East Asian context. This allows him to conclude that the "neoclassical growth theory [...] can explain most of the differences between the performance of the NICs and that of other postwar economies" (1995: 675).

The first point to be noted is the arbitrariness of the conceptualization of capital. Thus it is not clear why only durable inputs are included and why only certain categories of durable goods make up capital and others do not; why residential buildings are included (as if the owners of these buildings treated them in the same way that owners of commercial buildings do), or why durable structures are included and how should one interpret which durable structures should be included and which ones should not.

The second point to be noted is that these definitions completely disregard the theoretical debates noted above regarding the measurement of capital. As noted in chapter two, Sraffa pointed out that any financial measure of the amount of capital is determined partly by the rate of profit. This is problematic for neoclassicals because according to them the rate of profit is itself supposed to be determined by the amount of capital being used. In other words, there is circularity in the argument, and raises important questions about conclusions to be derived regarding factor rewards in growth processes in different countries with different 'factor endowments'.

In another study of the growth experiences of East Asian countries from a neoclassical perspective, Aghion and Howitt (2009) adopt an entirely different



conceptualization of capital to that adopted by Young and, not surprisingly, come to very different conclusions. Aghion and Howitt in fact adopt what is known as the ‘Schumpeterian growth model’ (see Baumol et al. 2007 for an explanation of this model). For them, growth can be generated through the improvement of innovation so that it directly affects the quality of products (Aghion and Howitt 2009). They contest Young’s idea of capital accumulation and its relationship to growth. For them capital is a storable final good which produces intermediate products and other final goods. The intermediate goods are seen as “the services of specialized capital goods, like computers and automobiles” (2009: 114). However in defining their production function they do the following,

$$Y_t = L^{1-\alpha} \int_0^1 A_{it}^{1-\alpha} x_{it}^\alpha di \quad 0 < \alpha < 1 \quad [3]$$

Where  $x_{it}$  is the flow of intermediate input  $i$ , but for them

$$x_{it} = K_{it} \quad [4]$$

Where  $K_{it}$  is the amount of capital used as input.

What is not clear from the analysis of Aghion and Howitt is what constitutes capital goods and how ‘amounts’ of it can be used in the production function; or how it can later be transformed to an ‘aggregate capital stock’ (2009: 114-115). Their definition is very vague making ‘capital’ a very malleable category even when the authors claimed there is ‘a’ final good that is storable, which can produce the intermediate goods; there is evidently a loophole in this explanation thus the elusive nature of the conceptualization, there seems to be great arbitrariness on the specifications. This is more evident when they try to explain the categories of ‘marginal product’, ‘rate of profit’ and ‘price’; the circularity mentioned in Sraffa’s argument in chapter two becomes obvious. The equations used in Aghion and Howitt’s analysis actually make it easier to see this.

For them, the price is the marginal product, defined as

$$P_{it} = \partial Y_t / \partial x_{it} = \alpha A_{it}^{1-\alpha} x_{it}^{\alpha-1} \quad [5]$$

And the maximization of profit is as follows

$$\Pi_{it} = \alpha A_{it}^{1-\alpha} x_{it}^\alpha - R_{kt} x_{it} \quad [6]$$

Where,  $R_{kt} x_{it}$  means the monopolist’s cost specified as

$$R_k K_{it} = R_k x_{it} \quad [7]$$

Simply by looking at this last equation we notice that because of [4],  $x_{it}$  is the amount of capital used, this then determines the cost. But look at equations

[5] and [6],  $x_{it}$  determines both the price *and* the profit. However we know from Sraffa that any financial measure of the amount of capital is determined partly by the rate of profit but in equation [6] capital is also determining the rate of profit. It is precisely the kind of circularity to which Sraffa was referring.

This analysis portrays a highly ambiguous conceptualization of capital where there is great arbitrariness in the choice of ‘capital goods’ that become in turn ‘capital’ and of the services provided by it. Furthermore through a simple analysis of their mathematical formulas, the circularity of their theory has been evidenced. This makes their conceptualization of capital totally illogical and vague, thus of little use for any meaningful implementation of economic growth studies in a real situation analysis. It is not surprising that Aghion and Howitt have big discrepancies with Young’s views on the East Asia results and that they find that other studies have numerical differences in the ‘observed factor prices’ as well as in the ‘observed rates of return on various financial instruments’ and ‘capital stock’ measurements (Aghion and Howitt 2009: 111). From the aleatoric conceptualizations of capital that both of the studies on East Asia have, it is rather obvious that this would be the case in their conclusions.

### *Africa*

The studies presented by Collier and Gunning (1999a), (1999b) move away from the assumption-model-conclusion format, but they remain highly ambiguous on their conceptualizations of capital, making it complicated to understand what is really at stake. I refer here to two of their investigations, both in the African context and as in previous studies particularly with regards to the conceptualization of capital. In the first study there is no actual definition of what capital means, which makes it difficult to understand what is meant by the following two statements,

“A study in Nigeria found that own generators accounted for three-quarters of the capital equipment of small manufacturers” (1999b: 11).

“Since 1980, African export revenue per capita has sharply declined, which in turn has induced severe import compression of both capital goods and intermediate inputs” (1999b: 14).

From these statements capital is understood as final products since any intermediate input is clearly excluded. However it is not clear what the difference is between an intermediate input and a capital good, or what makes something a capital good. There is a high degree of uncertainty that seems to allow for discretionary interpretations. However they continue explaining that,

“Weak economic growth helps explain a lower saving rate and a higher proportion of flight capital for Africa compared to the less developed nations of Asia and Africa” (1999b: 6).

Here the authors clearly are not referring to physical goods anymore. There is an additional conceptualization of capital however this is never explained in the text. A few pages later though they state that,

A striking implication [of the poor policy environment as described by the World Bank] is the conjunction of a high marginal return on capital and a very low rate of investment (1999b: 17).

Capital has somehow become a single homogeneous category that can provide a ‘return’, however what capital represents or how the return comes about is not addressed in this text.

In a second study from the same authors capital is treated much in the same way and a clear conceptualization of capital is never made. There is great vagueness in their analysis to the point it suggests purposely-constructed ambiguous conceptualizations. Suffice it to say that capital appears as representing a myriad categories, not all of which are explicitly explained, thus one may see throughout the text references to social capital, human capital, capital per worker, capital-hostile environment, capital-scarce region, capital goods, capital flight differentiated from domestic private capital stock which should exclude foreign-owned capital (1999a). With no consistency among each one of these clearly different expressions, the authors explain their views on the reasons for low growth in Africa. Recommendations on macroeconomic and microeconomic policies to address the causes of slow growth (1999a) based on their ambiguous conceptualizations of capital, are questionable given the level of ‘spontaneity’ the authors allow both at the theoretical as well as the technical level. The conceptualizations of capital in this text are on the whole ambiguous and imprecise rendering it problematic to understand inferences made from an analytical to a practical level.

### *A world perspective*

This last section looks at a neoclassical study of world growth by Sachs and Warner (1995). Their research focuses particularly on ‘poorer’ countries, where it is claimed that higher-than-average growth and convergence are possible under “‘appropriate’ market-based economic policies” (1995: 6-7). The actual conceptualization of capital is never mentioned in the text, and this is surprising since they explain that there are a number of criteria (such as being a socialist country, undergoing domestic unrest, or extreme deprivation of civil or political rights) that “undermine efficient long-term private capital accumulation (including human capital accumulation), which is a fundamental feature of economic growth” (1995: 9). They point to the appendix for more information on variables and data source, and there we find a table explaining human and physical capital accumulation (not private capital) as a ratio of

“public and private investment spending to GDP”, averaged over a period of time in the case of physical capital and the “average accumulation of secondary schooling” in the case of human capital (1995: 36).

Again we find capital conceptualized in a different way. If the category ‘private capital’ should include both physical and human capital it seems obvious that they cannot be aggregated unless some common unit is defined. The fact that the authors look at investment ratios brings a completely different approach to the conceptualization of capital than that seen in the previous case studies. The analysis does conclude that it “presents evidence that a *sufficient* condition for higher-than-average growth for poor countries, and therefore convergence, is that poor countries follow reasonably efficient economic policies, mainly open trade and protection of private property rights” (1995: abstract). It does not come as a surprise that the perspectives from these authors also differ from that of others in previous examples. The recommendations on implementation of economic growth theory to developing countries are as diverse as the conceptualizations of capital.

### 3.4 Concluding remarks

This chapter has reviewed the conceptualizations of capital that have been used in theoretical and policy related models of economic growth. The starting point was taken to be the work of Robert Solow (1956), writing before the capital controversies and describing capital as a homogeneous category that could serve as output as well as input (when saved and reinvested). This was followed by a discussion of the so-called endogenous growth theory identified with the work of Paul Romer (1986, 1990), who assumed capital to be a cluster of physical goods which could be aggregated by assuming them all to be produced using fixed-input proportions thereby making them in effect all the same input. The last group of academic growth models reviewed showed capital to be treated in an entirely inconsistent and ambiguous manner.

The review of the theoretical growth models was then followed by the review of four case studies. Two of them focused on the experience of East Asian economies in seemingly different ways and through contrasting conceptualizations of capital reached clearly distinct conclusions. In the case of the African experience there were multiple conceptualizations of capital throughout both texts analyzed, which made it very difficult to know unambiguously what the authors were referring to and how they derived various explanations and reasons to why Africa has grown slower than other regions. In the last case study reviewed Sachs and Warner (1995) were shown to analyse world economic growth following a very broad conceptualization of capital; however, fundamental policy conclusions regarding the importance of open trade and protection of property rights were derived on the basis of their model.

This first analysis of the conceptualization of capital in different economic growth theories already raises many questions with respect to how theoretically and practically these changing notions can co-exist under the same neoclassical understanding of economics. One more topic will be addressed –comparative advantage theory, before concluding on the multiple views of the conceptualization of capital.



*I wonder what certain Souths have done to deserve certain Norths (author's translation from Quino)*

## Chapter 4

# Comparative Advantage Theory and the Conceptualization of Capital

### 4.1 Introduction

The theory of comparative advantage is a trade theory that can be traced back to David Ricardo. It is not however due to its long lasting nature that it is brought to the front in this research, but rather to the debatable nature of the conceptualization of capital that has been used by its many followers, and the importance accorded to it in development policy recommendations. In what follows I will adopt a similar approach to that adopted in chapter three; I will begin with a review of the general theoretical literature and then move to a consideration of its application in case studies with policy implications for developing countries. Specifically, I propose to begin by analyzing the major contributions to comparative advantage theory, mainly the Heckscher-Ohlin (HO) model as well as its later version, the Heckscher-Ohlin-Samuelson (HOS) model. I am aware that this will only scratch the surface of the available literature developed on comparative advantage, but since the HOS model particularly, has been widely used in development studies I take it as a point of reference.

After a brief account of the historical origins of the theory I will look at current perspectives that have been advanced particularly after the capital controversies as well as at trade policies and recommendations that have been derived from various perspectives on this topic. As in the previous chapter and following the argument of this research, I will limit my focus to the conceptualizations of capital in different trade perspectives and will leave aside the conditions and consequences of other equally interesting changes that have

arisen from new trade theory. It will become apparent once again that the conceptualization of capital in various neoclassical theoretical and policy-related studies is diverse, vague and pays little attention to the theoretical problems that have already been noted.

## 4.2 Comparative advantage: a historical recount

### *The classic theory of comparative advantage*

As John Chipman (1965) explains, the theory of comparative advantage advanced by David Ricardo was focused on the idea of a single input of production: labor. Factors were seen as perfectly immobile between countries and the only way to trade was to exchange finalized goods regardless of integration within industries. Chipman explains that Ricardo's example considers the labor input to be mobile within a country thus "the unit cost of each good [is] constant, depending only on the amount of labor required to produce it" (1965: 479). In that context Ricardo favored free trade arguing solely on the basis of productivity of workers in different countries.

In the context of our analysis, it is then clear that the conceptualization of capital was disregarded since the sole input is labor and all other inputs are not even quantified in the production process. This was widely rejected by neoclassical economists and is the reason why they sought to expand the theory taking into account other factors than only labour so that it would better represent actual conditions of international trade and comparative advantage (Jones 1979).

### *Heckscher-Ohlin model*

Krugman and Obstfeld point to the rise of the Heckscher-Ohlin (HO) theory as an elaboration of the Ricardian model. Given that labor is not the only factor of production and Ricardo did not explain the causes of productivity differentials, a new perspective emerged known as the 'factor-proportions theory' primarily based on the need to include a country's factor endowments into the equation (Krugman and Obstfeld 2003). The idea was developed by two Swedish economists in 1919 and 1933. In this model, productivity differences are not traced to labor alone but to initial endowments of individual factors of production. However as a neoclassical analysis of international trade the Heckscher-Ohlin model bears many of the common assumptions in that tradition, some of which were already mentioned in the previous chapters. Nonetheless, Ronald Jones (1979) gives a summarized depiction of the model as a two-country, two-factor, two-commodity environment, where perfect competition and constant returns to scale prevail. Furthermore there are no transfer costs between factors or difference in technology for production; tastes are the same in all countries, and each has

different but fixed, endowment quantities either, capital or labor –two homogeneous factors of production, which are fully employed (Jones 1979: 6).

This conceptualization of capital as a homogeneous category is what allowed to develop a theory that explained price differentials based on different ‘proportions’ of factor endowments since they also assumed identical production functions (R. Robinson 1975: 6). Then a country was assumed to have an unchanging amount of something called ‘capital’ (or labor) which allowed it to produce ‘capital-intensive’ (or ‘labor-intensive’) products depending on the original share of each factor that it ‘naturally’ had. Paul Samuelson retook the ideas of Heckscher and Ohlin to elaborate on their model adapting it to a new set of conditions to which we now turn.

### *Heckscher-Ohlin-Samuelson model*

John Chipman (1965) refers to the contributions of Paul Samuelson and Abba P. Lerner, as a ‘modern’ approach to trade theory and particularly believes that they brought to light the ‘most important role of factor endowment’ from Heckscher and Ohlin ideas. He describes the results as probably representing “the most complex and impressive theoretical structure that has yet been developed in economic thought” (1965: 479). However, speaking about the same model Mark Blaug (1992) claimed that many of the significant variables had been dropped from the original Heckscher-Ohlin theorem (such as demand conditions and economies of scale) actually departing from the views of the original thinkers. In any case the new model was meant to explain through free trade not only partial equalization of factor prices –the Heckscher-Ohlin argument, but complete equalization. Samuelson (1948) believed that “not only [was] factor-price equalisation possible and probable, but in a wide variety of circumstances it [was] inevitable” (1948: 169).

Samuelson (1948), in one of the first models that served as a continuation of the works of Heckscher and Ohlin, started with a design that only contemplated production in terms of land and labor. His conceptualization of capital was a homogeneous category perfectly replaceable in the model for any of the other factors of production. He claimed that under the neoclassical assumption of ‘optimal production-possibility curve’ the marginal rate of ‘factor’ substitution should be equal in the two industries he analyzed –food and clothing. To this he adds that “the slope at any point of the production-possibility curve will be exactly equal to the ratio of labor's marginal productivity in clothing to labor's marginal productivity in food; or to what will be the same thing at such an optimum point, to the corresponding ratio of the marginal physical productivities of capital” (Samuelson 1948: 175). Although he never actually explains what he means by capital in this model, the fact that he can effectively ‘compute’ a marginal productivity shows an understanding of ‘capital’ as a homogeneous category and indifferent from land or labor. This conceptualization was a common perspective prior to the capital controversies mentioned in chapter two. As Turan Subasat (2003) explains, “capital [was]



treated as a nonproduced input and as externally given to the economy. Since it is not produced, it can be treated as an endowment, like land, natural resources, and population” (Subasat 2003: 156). We turn then to the views that followed the Cambridge debates to understand how capital was subsequently conceptualized in this theory.

### 4.3 Current perspectives

#### *Paul Samuelson revisited*

In the post-Cambridge environment, Samuelson put forward a modified version of the comparative advantage theory in which he preserved the two-country, two-good model but tried to account for the fact that commodities are “produced by labor inputs and also by the commodities themselves as needed inputs” (Samuelson 1975: 310). However in that model he also maintained the labor/land comparisons and determined the differences among countries based on labor/land ratios to produce two goods –cloth and food. In the mathematical appendix to this paper Samuelson concurs with the warnings of his Sraffian and other critics against the use of “such aggregate capital magnitudes [money magnitudes of ‘capital’], which only work in certain Santa Claus cases (surrogate capital and worse)” (Samuelson 1975: 351-352). Samuelson’s surrogate capital view was already discussed earlier in the text clarifying that it effectively collapsed all goods into a single-good model. In his 1975 text he nevertheless still continued to try to define a model in which he could aggregate heterogeneous goods in monetary values concluding that there is “one example, not so much congenial to a neoclassical apologist as to one who hopes to use a Marxian aggregated two-department model” (Samuelson 1975: 352). In doing so Samuelson confirms the impossibility of aggregating heterogeneous goods in a neoclassical setting in monetary values.

#### *Ronald Findlay*

In a very different approach, Ronald Findlay (1995) tried to account for three rather than two factors of production. In an attempt to explain his view of the U.S. comparative advantage in manufacturing in 1879-1940 not as a result of their ‘edge technology’ but from a relative abundance in natural resources, he developed a model to synthesis factor proportions and economic geography to account for comparative advantage in the industries that made great use of some specific natural resources (1995: 153). He describes a setting with three countries and three goods X, Y and Z where “[t]he first is a consumer-cum-capital-good a la Solow that can be either consumed or invested (added to the stock of capital). The second, also a final good, is a pure consumer good. The third good Z is an intermediate (or raw) material that is required in fixed proportions for the production of good X” (1995: 153).

Findlay's views on comparative advantage completely ignore the idea of goods that must be produced with other goods and maintains a model based on a single input-output commodity, the kind that serve multiple purposes. As we saw earlier this conceptualization was highly problematic and was abandoned by modern Walrasians and Austrians who, after the Cambridge controversies, distanced themselves from a conceptualization of capital defined as a single homogeneous category. It is only New-Keynesians who dismiss these critics and still believe in the possibility of 'capital' as a homogeneous value magnitude or as the accumulation of goods produced in the past that are going to be used in the future and can be aggregated or measured regardless of their units. In the next paragraphs we look at the extensions of trade theory along these lines put forward by the adherents of this neoclassical subgroup.

### *Paul Krugman*

In chapter two Krugman and Obstfeld (2003) presented two competing concepts of capital; one as inputs to production equalizing heterogeneous inputs in the long run and one as flows of money. However in his book, *Rethinking International Trade*, Krugman (1990) obviates the use of the word 'capital' for the most part. Nevertheless in chapter nine he portrays a "two-region world in which the industrial sectors of regions grow through the accumulation of capital" (1990: 93) and the dual conceptualization of capital surfaces again. It is a rather elaborate argument so I will try to explain each step. Usual assumptions are made, equal technology, equal labor forces, no transportation costs, and full employment of 'factors'.

He portrays a world in which two regions can produce two goods, manufacturing (M) and agricultural (A). He then argues that A are manufactured by labor alone and M by labor and capital. He never actually explains what this homogeneous category includes, but specifies that the production of M requires capital and labor in fixed amounts (1990: 94). There is a world price for M products in terms of A. Here it already looks strange since the production of M, which requires 'capital' and labor will be determined in terms of A which only requires labor. To 'solve' this problem he assumes for 'simplicity' two pages later that "capital goods are produced by labor alone; that is we include them as part of 'agricultural' output" (1990: 96). There is a particular reason for making this assumption.

He determines that the 'return' to a unit of capital "measured in agricultural (or wage) units, is *also* the profit rate" (1990: 96 emphasis added). With this in mind he then adds that saving behavior is 'classic' "all profits and only profits are saved", this way he can assert that "the savings assumption means that, if there is no international investment, the rate of growth of the capital stock in each region will just equal the rate of profit" (1990: 96). In other words, capital goods are made with labor alone and that creates a homogeneous category that can have a return measured in wages. But only some of those wages become profits (that is never explained how or why) and that profit then becomes what in accumulation is called 'capital stock', which

Krugman assumes is naturally comparable with international investment. This means that unless agricultural wages are given out in physical goods, capital in this text is both something physical and something non-physical that can be related to international investment. It is clear that he has made use of a changing conceptualization of capital that is not clearly pointed out in the text, but rather blurred in the description and ambiguously utilized.

### *James Harrigan*

A different attempt made by New-Keynesians was to illustrate an index of heterogeneous goods that enter a production process. Similar approaches have been used in growth theory with little success, as we saw in the previous chapter. One representative of this perspective is James Harrigan, who develops a model mainly based on mathematic estimations. In his paper he recognizes the oversimplification of neoclassical models and their inability to be test the general equilibrium theory that neoclassical economics advocates, however he surprisingly concludes that his “estimated model turns out to be statistically successful and generally in line with the predictions of theory, so the neoclassical model comes out looking rather well” (Harrigan 1996: 4-5). In this research the conceptualization of capital becomes very relevant as he affirms neoclassical theory can still predict “that international specialization will be jointly determined by cross-country differences in relative factor endowments and relative technology levels” (1996: abstract).

Harrigan explains that the computation of his indexes “requires real, internationally comparable data on value added, labor input, and capital input” (1996: 12). From this assertion alone, at this point, we already know that he has taken capital to mean an independent and externally given category that can be quantified. He believes that this category is just like labor and land as he expresses that there are “three types of factor supplies: land, labor, and capital” (1996: 14). As we have pointed out elsewhere, this conceptualization completely ignores the failures of neoclassical theory to explain the amalgamation of distinctively different heterogeneous goods. Like in many other studies on comparative advantage theory, data on the aggregation of ‘capital’ comes from the Penn-World Tables. For the time being we will not get into details of the Penn World Tables, as they will be revised in the next section. Suffice it to note here that at the theoretical level the interpretation of the concept of capital has once again puzzle us by imagining a category that can comprise the ‘real’ value added of ‘capital’. We move then to practical applications of the theory of comparative advantage and their conceptualizations of capital.

## 4.4 Applied perspectives

### *Anne Krueger*

In her study on *Trade Policy and Economic Development*, Anne Krueger (1997) explains how new knowledge on trade during the 1970's demonstrated old falsities on previous trade theories. She asserts that previous versions of trade models did not recognize the need to include the 'three' factors of production (land, labor, and capital). Krueger herself was involved in the development of those trade models in which three factors of production are included, but the distinctive feature is that "each good requires only two factors of production as inputs: one factor is specific to each sector and one factor is mobile between the two sectors... labor is regarded as mobile... land is treated as the factor employed only in agricultural production, and capital is the factor specific to manufacturing" (Krueger 1977: 12). For Krueger capital continues to be a homogeneous and non-produced input; it is treated as if it were the same as land or labor and readily available to the economy.

Throughout her text the category 'capital' is continuously used to determine 'capital-intensive' forms of production, even if 'capital' has never been explained beyond the classification of 'factor of production'. The lack of a conceptualization of capital in the original model did not stop her from making important policy recommendations at later stages explaining that,

"As the three-factor models demonstrated, comparative advantage lies within manufacturing and within agriculture, and not between them. [...] countries with a much higher land-labor ratio have a comparative advantage in more land-using agricultural commodities and their comparative advantage in manufacturing lies more in goods with higher capital-unskilled labor ratios. In these models, the overall trade balance in manufactures is a function of the size of the manufacturing sector, itself a function of past capital accumulation and the land-man ratio" (Krueger 1997: 11).

Not surprisingly, in that second analysis there is no conceptualization of capital either. It is assumed an obvious category making the conceptualization of capital a vague and misleading statement. It is clear that the theoretical changes in the conceptualization of capital in trade theory remain vague, ambiguous and oblivious of previous criticisms making it not only highly problematic at the theoretical level but also highly unrealistic that policies driven from such interpretations can truly depict international patterns of trade and specialization.

### *Multi-cone models*

In an effort to include the latest literature on trade and comparative advantage, I have reviewed a number of recent articles on the topic. I have found it extremely difficult to navigate through the sophisticated mathematical

expressions and econometric models, however for the most part they deal with a ‘continuum of goods’ in what they call a ‘multi-cone factor’<sup>6</sup> model (Deardorff 1998), (Bernhofen 2009), (Schott 2003). In general it assumes the case of  $n$  countries, all with similar technologies so they can all produce any good, where countries are ranked according to a relative ‘capital abundance’; factor endowments are assumed ‘sufficiently dissimilar’ so that in equilibrium ‘factor price ratios will reflect endowment ranking’ (Bernhofen 2009: 17). Although an actual conceptualization of capital is not always included, authors make plenty of references to a country’s ability to accumulate and produce different kinds of goods that are capital-intensive (or labor-intensive).

Peter Schott describes capital, he calls it a ‘productive factor’ just like labor (Schott 2003: 4). It can be a ‘stock’ or it can be accumulated. In the mathematical conceptualization of his model he describes,

$$\frac{Q_{ic}}{L_c} = \beta_{li} + \beta_{2i} \frac{K_c}{L_c} \left( \frac{T_c}{L_c} \right) + \sum_{t=3}^{T+2} \beta_{it} \max \left\{ \frac{k_c}{L_c} - \tau_{t-2} \left( \frac{T_c}{L_c} \right), 0 \right\} \quad [8]$$

Where  $K_c / L_c$  is a country’s computable capital-labor ratio (the rest of the variables can be ignored for our purposes). However to calculate that ratio he must assume that “manufacturing capital endowments” are computed from a series of databases from the UNIDO database<sup>7</sup> or the Penn World Tables, which display “a set of national accounts economic time series covering a large number of countries” (Summers and Heston 1991: 327). As it was explained in the growth chapter, the problem with this conceptualization of capital is that the Penn World Tables use prices of goods, which assumes that capital can be defined independently of the return on it. Furthermore, this allows for a voluntaristic approach to the categories included in such databases. As they intend to portray many countries’ realities, the categories that are included (or excluded) have a direct impact on the policies that are derived from it. Thus the conceptualization of capital in an analysis of this type becomes crucial for the results obtained and the recommendations made to developing countries. They serve for example Schott in claiming that,

“Previous empirical evaluations of the Heckscher-Ohlin model have focused on its least realistic equilibrium, namely that all countries produced all goods and offer their workers the same quality adjusted wages. This paper, in contrast, develops a technique that is sensitive to a richer version of the model where countries are allowed to specialize in distinct mixes of goods depending upon their relative endowments” (2003: 22).

From his conclusion, it is clear that the conceptualization of capital has a ‘real world’ effect and that the way in which it is utilized based on vague and ambiguous theoretical conceptualizations can significantly impact the results obtained.

## *The GTAP*

Another example of the application of trade theory based on comparative advantage can be seen in the use of the Global Trade Analysis Project (GTAP)<sup>8</sup>. The idea behind it is to track the circulation of flows of income - derived from the sales of 'endowment commodities', expenditure, production - a combination of income flows and intermediate goods, and finally of exports and imports (Hertel and Tsigas 1997). However the model defines capital as one of the endowment commodities along with land and labor. Thus we fall again into a pattern already discussed where capital is assumed a homogenous category that can be used interchangeably with land or labor and determined externally. The GTAP is supposed to provide another set of numerical information to assess 'real' world phenomena and thus permit to build this capital 'value'. But as it was mentioned earlier, the arbitrariness with which these models can be built is highly questionable; nonetheless they are commonly used to determine policy recommendations in developing countries.

In a paper that claims to focus on the potential impacts of Economic Partnership Agreements (EPAs) between the European Union (EU) and other regions, recommendations like the following are derived from the use of the GTAP,

“assuming that most of the poor population falls in the category "unskilled workers", the results of our simulations seem to hint to a positive impact of liberalization on poverty” (Keck and Piermartini 2005: 26);

“Due to the importance of the EU as a trading partner for many SADC [Southern African Development Community] economies, liberalization in the context of EPAs already goes a long way towards realizing such gains” (2005: 36)

In a second example, a study on the possible effects of Free Trade Agreements (FTA) in the Association of Southeast Asian Nations (ASEAN) claims that,

“GTAP simulations indicate that an ASEAN + 3 FTA will generate welfare gains for all members from the highest of 12.5% of GDP for Thailand and 6.6% for Viet Nam to the lowest of 0.19% for Japan and 0.64% for the [People's Republic of China]” (Kawai and Wignaraja 2007: 17).

“[the] consolidation of multiple and overlapping FTAs into a single East Asian FTA can help mitigate the harmful “noodle bowl” effects of different [Rules of Origin] and standards. This move will encourage the participation of low-income countries in freer trade arrangements, reduce trade-related business costs particularly for

[Small and Medium Enterprises], and promote trade and investment” (2007: 24).

Both studies and their policies hint at the untapped benefits of free trade where countries will continue to gain from their comparative advantages and better compete in an open economy. However the wide use of a model based on an evidently ambiguous conceptualization of capital, where the choice of what constitutes capital and what does not is unbound, seems to leave a large amount of freedom in the determination of public policies.

### *The World Bank growth report*

The last case study that evidences the use of multiple conceptualizations of capital is the World Bank Growth Report of 2008. The report introduces various definitions of capital, making the use of this ‘category’ quiet voluntaristic in the approach to the theory of trade. Capital can actually be defined as investment rates -percentage of GDP (World Bank 2008: 150), it can include commercial bank lending, bonds, private credits, foreign direct investment (FDI) or portfolio equity investment (2008: 159), or it can be assets such as bonds or shares (2008: 167), or also assets such as plants and equipment (2008: 168).

The problem with various conceptualizations of capital in this respect is not only at the theoretical level, but that the recommendations made are either meaningless or terribly dangerous as they could imply a series of drastically different measures when asserting for example that, “an economy’s endowment of labor, natural resources, and capital dictates its comparative advantage. But this mandate is very broad” (2008: 25). What kind of capital would exactly identify the comparative advantage of one country versus another in such a context? This illustrates the level of confusion that multiple conceptualizations of capital create and demonstrates the voluntaristic approach that countries, international organizations, theorists, policy-makers, mathematical models, or any other can make to the concept of capital. The validity of a theory that rests on ‘capital’ as some sort of ‘endowment’ to different countries is highly questionable to say the least.

## **4.5 Concluding remarks**

This chapter has focused on the conceptualizations of capital that have been used in theoretical and policy related neoclassical trade theory. The Heckscher-Ohlin model and Heckscher-Ohlin-Samuelson addition were taken as points of departure. In these early models capital was used as a homogeneous category externally given and interchangeable with labor and land.

However, after the capital controversies Samuelson recognized that it was impossible to use capital as a single monetary magnitude representing heterogeneous goods, thus acknowledging the inability of neoclassical theory to portray comparative advantages or price equalizations of factors when one accounts for different goods. Nonetheless other scholars have continued to rely on conceptualizations of capital that have been shown theoretically flawed. Findlay reverted to Solow's problematic conceptualization; Krugman interchangeably spoke of capital as physical goods as well as investment flows; and Harrigan continued to value heterogeneous goods in monetary equivalences; every scholar found a way to mould the category 'capital'. It was clear that the conceptualization of capital remains vague and ambiguous, that there is no consistency among neoclassical authors and that many of them simply overlook already demonstrated failures in its conceptualization.

This theoretical review was followed by a series of concrete examples where the voluntaristic uses are apparent and in many ways problematic. From Krueger's three-factor model to a series of econometric analyses that model world trade or databases to account for countries' 'actual capital', the conceptualizations were changed at the will of the authors, reinforcing the lack of clarity and ambiguity with which the concept is used. Either capital was seen as a single homogeneous (input-output) category or it was portrayed as a single monetary value that included certain types of products –categories that also changed from one author to the other. Finally some of these studies made use of a number of different conceptualizations of capital in an aleatory manner within the same study.

It comes as no surprise that the policies derived from these views were as vast as the conceptualizations of capital. From free trade, to specialization, to comparative-advantage based trade; a series of policies were recommended to developing countries to best use their 'factor endowments'. What is clear from this section is that there is great liberty on what can be called 'capital' and the multiplicity, vagueness and ambiguity with which capital is conceptualized has been shown to have a direct impact on the kinds of policies and recommendations that are made to developing countries. In the next section we conclude on the main findings of this research.



## Chapter 5

### Conclusion

This research has focused on the conceptualizations of capital in neoclassical economics both at the theoretical as well as at the practical levels. It has centred its attention mainly on the conceptualizations of capital made after the Cambridge controversies of the 1950's through 1970's since at that point previous neoclassical conceptualizations of capital had been shown to be theoretically flawed. It then analyzed how different subgroups in the neoclassical paradigm have attempted to overcome these theoretical failures. It was shown that some of these schools, mainly modern-day Walrasians and Austrians, have clearly distanced themselves from previous conceptualizations of capital, making their renewed definitions of little use in practical economic analyses or highly unrealistic, due to the constrictions they have been forced to make. On the other hand, New-Keynesians have continued to make extensive use of ambiguous conceptualizations, which fail to recognize already demonstrated theoretical problems. Nonetheless these problematic conceptualizations were shown to be the most commonly used in policy-related analyses. The voluntaristic approaches to the conceptualization of capital were evidenced in the use all neoclassical authors make of it when considering other economic topics pertinent to development studies.

Chapter three presented the various conceptualizations of capital that are used in neoclassical economic growth theory. It evidenced that authors in this tradition fall in the same homogenizing mistakes when they attempt to conceptualize capital. They either reduce economic production to one good that serves as input as well as output that can be treated indistinctively from land or labor; or they reduce heterogeneous goods to monetary equivalences ignoring the implications this has in the determination of the rate of profit in neoclassical theory; or the least creative, simply avoid an explanation in their analyses and assume it a naturally given, non-produced factor. All considered the conceptualization of capital remains a clearly ambiguous and vague concept in neoclassical economic growth literature. There is no conclusive nor agreed definition but rather a myriad of aleatory uses of these changing conceptualizations of capital. This has serious implications on policy-related topics, particularly in the context of developing countries.

Very similar results are found in chapter four. It reviews the conceptualization of capital made in neoclassical trade theory from the classic to the modern views on comparative advantage. The chapter discloses the multiple conceptualizations of capital made in one study after the other, all in a clearly voluntaristic and overall vague manner. Some of these conceptualizations go back to older perspectives that have been demonstrated problematic and others simply assume them away through absurd initial assumptions. In a few studies, the conceptualizations of capital are blurred in countless mathematical formulas, which cannot be sustained theoretically. The

changing conceptualizations of such a pivotal concept have countless repercussions on the way we understand policy recommendations in developing countries.

The results from the case studies and the policy related examples in both chapters are very similar. The approach to the conceptualization of capital was shown to be voluntaristic and completely ambiguous. The recommendations derived from those analyses are as diverse as the conceptualizations of capital, leaving one to believe that there is no theoretical nor scientific validity to their assertions, but rather suggests that these conceptualizations are used in order to yield a set of pre-ordained ideological conclusions. The inability of this theory to explain issues at the heart of development studies should come as a wake up call particularly to those in developing countries.

With the unveiling of the ‘nakedness’ of a long praised form of *capital-ism* in 2008, there is a palpable example of the failure of neoclassical theory to portray the reality it has theoretically attempted to explain for over a hundred years. Developing countries have been forced to assume that paradigm for over sixty years and some of them for much longer. The answers to inequality, poverty and the lack of alternatives will not come from neoclassical theory. Their conceptualizations of capital cannot explain them, perhaps because they never intended to do so.

## Notes

<sup>1</sup> Aspromourgos makes clear that Hayek did not actually use the term but rather Hicks use him as authority (Aspromourgos 1986: 268).

<sup>2</sup> This also assumes that the knowledge on how one may be substituted for the other is given (Harcourt 1972: 15-16).

<sup>3</sup> Not only the final prices of those goods but also the prices of all the differently produced goods, which are also made with labor and other produced goods in turn.

<sup>4</sup> “That is, given arbitrary initial capital stocks, the economy will converge over time to a steady-state (dynamic) equilibrium only if very special initial prices are specified; for ‘almost all’ values of initial prices, the economy will be unstable” (Burmeister 1980: 7).

<sup>5</sup> It is worth noting on this point that such an understanding of growth would be problematic from a modern Austrian perspective where human capital is not understood separately from labor, but must remain distinctively different from ‘capital’ (Horwitz 2000).

<sup>6</sup> The word cone refers to a “set of endowment vectors” (Schott 2003: 4).

<sup>7</sup> UNIDO stands for United Nations Industrial Development Organization. The principal data source for their analysis is Penn World Tables (PWT) (Isaksson 2009: 39).

<sup>8</sup> The GTAP defines itself as a large network of researchers and policy makers focused on quantitative analysis of international policy issues through the use of quantitative analysis tools that reproduce a global computable general equilibrium model (Gtap 2002).

## References

- Aghion, P. and P. Howitt (2009) *The economics of growth*. Cambridge: MIT Press.
- Alec Gee, J.M. (1991) 'The neoclassical school', in D. Mair et al. (eds), *A modern guide to economic thought: an introduction to comparative schools of thought in economics* (pp. 71-108). Hants: Edward Elgar.
- Arnsperger, C. and Y. Varoufakis (2008) 'Neoclassical economics: Three identifying features', in E. Fullbrook (ed.), *Pluralist Economics*. New York: Zed Books Ltd.
- Aspromourgos, T. (1986) 'On the origins of the term 'neoclassical'', *Cambridge Journal of Economics* 10: 265-270.
- Baumol, W., R. Litan and C. Schramm (2007) *Good capitalism, bad capitalism and the economics of growth and prosperity*. New Haven: Yale University Press.
- Bernhofen, D. (2009) 'Predicting the pattern of international trade in the neoclassical model: a synthesis', *Economic Theory* 41(1): 5-21.
- Blaug, M. (1992) *The methodology of economics or how economists explain* (2nd ed.). Cambridge: Cambridge University Press.
- Burmeister, E. (1980) *Capital theory and dynamics*. Cambridge: Cambridge University Press.
- Burmeister, E. (2000) 'The capital theory controversy', in H. Kurz (ed.), *Critical essays on Piero Sraffa's legacy in economics*. Cambridge: Cambridge University Press.
- Chipman, J.S. (1965) 'A survey of the theory of international trade: Part 1, The classical theory', *Econometrica* 33(3): 477-519.
- Cohen, A.J. and G.C. Harcourt (2003) 'Retrospectives: Whatever happened to the Cambridge capital theory controversies?' *Journal of Economic Perspectives* 17(1): 199-214.
- Colander, D. (2000) 'The death of neoclassical economics', *Journal of History of Economic Thought* 22(2).
- Collier, P. and J.W. Gunning (1999a) 'Explaining African economic performance', *Journal of Economic Literature* 37(1): 64-111.
- Collier, P. and J.W. Gunning (1999b) 'Why has Africa grown slowly?' *The Journal of Economic Perspectives* 13(3): 3-22.
- Deardorff, A. (1998) 'Does growth encourage factor price equalization?' Ann Arbor, Michigan: The University of Michigan.
- Findlay, R. (1995) *Factor proportions, trade, and growth*. Cambridge, MA: The MIT Press.
- GTAP (2002) Global Trade Analysis Project. Retrieved September 29, 2009, from <https://www.gtap.agecon.purdue.edu/default.asp>.

- Harcourt, G.C. (1972) *Some Cambridge controversies in the theory of capital*. Cambridge: Cambridge University Press.
- Harrigan, J. (1996) 'Technology, factor supplies and international specialization: Estimating the neoclassical model', *NBER Working Paper Series* 5722.
- Hertel, T. and M. Tsigas (1997) 'Structure of GTAP', in T.W. Hertel (ed.), *Global trade analysis: modelling and applications* Cambridge University Press.
- Himmelweit, S. (1977) 'The individual as basic unit of analysis', in F. Green et al. (eds), *Economics: An anti-text*. London: Macmillan Press Ltd.
- Horwitz, S. (2000) *Microfoundations and macroeconomics: An Austrian perspective*. London: Routledge.
- Howard, M. (1983) *Profits in economic theory*. London: The MacMillan Press Ltd.
- Isaksson, A. (2009) 'The UNIDO world productivity database: An overview', *International Productivity Monitor* 18(Spring): 38-50.
- Jones, R. (1979) *International trade: Essays in theory* (Vol. 4). Amsterdam: North-Holland Publishing Company.
- Kawai, M.D. and G. Wignaraja (2007) *ASEAN+3 or ASEAN+6: Which way forward?* Paper presented at the conference 'Ten years after the crisis: Evolving East Asian financial system and challenges'.
- Keck, A. and R. Piermartini (2005) 'The Economic Impact of EPAs in SADC Countries'. Geneva: World Trade Organization: Economic Research and Statistics Division.
- Keen, S. (2001) *Debunking economics: The naked emperor of the social sciences*. Sydney: Pluto Press.
- Kreps, D.M. (1990) *A course in microeconomic theory*. New York: Harvester Wheatsheaf.
- Krueger, A.O. (1977) *Growth, distortions, and patterns of trade among many countries* (Vol. 40). Princeton studies in international finance: Princeton, NJ: Princeton University Press.
- Krueger, A.O. (1997) 'Trade policy and economic development: How we learn', *The American Economic Review* 87(1): 1-22.
- Krugman, P. (1990) *Rethinking international trade*. Cambridge: MIT Press.
- Krugman, P. and M. Obstfeld (2003) *International economics: Theory and policy* (6th International Edition ed.). Boston: Addison-Wesley.
- Loayza, N., P. Fajnzylber and C. Calderon (2005) *Economic growth in Latin American and the Caribbean: stylized facts, explanations, and forecasts*. Washington, D.C.: The International Bank for Reconstruction and Development/The World Bank.
- Lucas, R. (1988) 'On the mechanics of economic development', *Journal of Monetary Economics* 22(1): 3-42.

- Lucas, R. (2008 [1993]) 'Making a miracle', in C.B. Barrett (ed.), *Development economics: Critical concepts in development studies* (Vol. IV, pp. 3-27). New York: Routledge.
- Mankiw, G. (2004) *Principles of economics* (3rd International Students Edition ed.). Mason, OH: Thomson South-Western.
- Mankiw, G. and D. Romer (1991) *New Keynesian economics* (Vol. I Imperfect competition and sticky prices). Cambridge, Massachusetts: The MIT Press.
- Mankiw, G., D. Romer and D. Weil (1992) 'A contribution to the empirics of economic growth', *The Quarterly Journal of Economics* 107(2): 407-437.
- Marcuzzo, M.C. (2007) 'The "first" imperfect competition revolution', in W. Samuels et al. (eds), *A companion to the history of economic thought* (pp. 294-307). Oxford: Blackwell Publishing Ltd.
- Medio, A. (1977) 'Neoclassicals, Neo-Ricardians, and Marx', in J. Schwartz (ed.), *The subtle anatomy of capitalism*. Santa Monica: Goodyear Publishing Company, Inc.
- Nicholas, H. (Forthcoming) *Marx's theory of price*.
- Robinson, J. (1953-1954) 'The production function and the theory of capital', *The Review of Economic Studies* 21(2): 81-106.
- Robinson, R. (1975) 'Factor proportions and comparative advantage', in R. Caves et al. (eds), *Readings in international economics*. London: George Allen and Unwin Ltd.
- Rodrik, D. and A. Subramanian (2005) 'From "Hindu growth" to productivity surge: The mystery of the Indian growth transition'. Washington D.C.: International Monetary Fund.
- Romer, P. (1986) 'Increasing returns and long-run growth', *The Journal of Political Economy* 94(5): 1002-1037.
- Romer, P. (1990) 'Endogenous technological change', *The Journal of Political Economy* 98(5): S71-S102.
- Rotheim, R. (1998) 'Introduction', in R. Rotheim (ed.), *New Keynesian economics/Post Keynesian alternatives* (pp. 1-7). London: Routledge.
- Rowthorn, B. (1974) 'Neo-Classicism, Neo-Ricardianism and Marxism', *New Left Review* 86: 63-87.
- Sachs, J. and A. Warner (1995) 'Economic convergence and economic policies', *NBER Working Paper Series* 5039.
- Samuelson, P.A. (1948) 'International trade and the equalisation of factor prices', *The Economic Journal* 58(230): 163-184.
- Samuelson, P.A. (1962) 'Parable and realism in capital theory: The surrogate production function', *The Review of Economic Studies* 29(3): 193-206.
- Samuelson, P.A. (1975) 'Trade pattern reversals in time-phased Ricardian systems and intertemporal efficiency', *Journal of International Economics* 5(4): 309-363.

- Sawyer, J. (1989) *Macroeconomic theory: Keynesian and Neo-Walrasian models*. New York: Harvester Wheatsheaf.
- Schott, P.K. (2003) 'One size fits all? Heckscher-Ohlin specialization in global production', *The American Economic Review* 93(3): 686-708.
- Solow, R.M. (1956) 'A contribution to the theory of economic growth', *The Quarterly Journal of Economics* 70(1): 65-94.
- Sraffa, P. (1958) *Interventions in the debate at the Corfu Conference on the "Theory of Capital"*: 4-11 September 1958.
- Sraffa, P. (1960) *Production of commodities by means of commodities: A prelude to a critique of economic theory*. Cambridge: Cambridge University Press.
- Subasat, T. (2003) 'What does the Heckscher-Ohlin model contribute to international trade theory? A critical assessment', *Review of Radical Political Economics* 35(2): 148-165.
- Summers, R. and A. Heston (1991) 'The Penn World Table (Mark 5): An expanded set of international comparisons, 1950-1988', *The Quarterly Journal of Economics* 106(2): 327-368.
- Walsh, V. (1997) 'Capital goods', in D. Glasner (ed.), *Business cycles and depressions: an encyclopedia* (pp. 80-83). New York: Garland Publishing.
- Wicksell, K. (1934 [1901]) *Lectures on Political Economy* (E. Classen, trans. Vol. I). London: Routledge & Kegan Paul Ltd.
- World Bank (2008) 'The Growth Report: Strategies for sustained growth and inclusive development'. Washington, D.C.: The International Bank for Reconstruction and Development/The World Bank.
- Young, A. (1995) 'The tyranny of numbers: Confronting the statistical realities of the East Asian growth experience', *The Quarterly Journal of Economics* 110(3): 641-680.