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# Development Planning in the XXI Century? A Note on Old and New Methods and Tools

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The recent crisis of the Washington Consensus has brought with it the return of the involvement of the state in the development process in a number of countries. However, a lot of water has run under the bridge since the golden years of development planning. In this note we review the main methods and tools of development planning applied during those years, we evaluate their contemporary relevance, and we discuss the potential usefulness of newer tools to deal with some essential characteristics of the development process such as intertemporal dynamics, uncertainty and institutional innovation. We also review the theoretical and political changes that went along with the ups and downs of development planning.

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## **1. Development planning methods and tools in the "golden age" of development**

The golden age of development theory and practice extended from the 1940s to the 1970s. While advances in theory followed the lead of "development pioneers" such as Hollis Chenery, Albert Hirschmann, Arthur Lewis, Gunnar Myrdal, Ragnar Nurkse, Raul Prebisch, Paul Rosenstein-Rodan and Walt Rostow, major institutional steps were also taken to make their visions and theories operational. To do so, after the Second World War a growing number of developing countries created planning offices or equivalent institutions and, together with regional and international organizations, began to develop and to apply an increasing number of tools for development planning.

The most influential international institution, given its technical and financial capacity, was the World Bank. The Bank reached its peak in terms of the development of sophisticated planning tools under the direction of Hollis Chenery - in his capacity as Chief Economist of the Bank between 1972 and 1982 - who worked in close collaboration with leading scholars such as David Kendrick (1979) in sectoral planning and Lance Taylor (1979) in macro planning. Also very influential in terms of training and dissemination of development planning tools were the Economic Commission of Latin American and the Caribbean and its Latin American Institute for Economic and Social Planning, both under the leadership of Raul Prebisch.

From the 1940s until the 1970s, a number of development planning methods and tools of increasing complexity and sophistication were developed and applied. They covered different levels: micro, sectoral, intersectoral, and aggregate growth.

For microeconomic planning, the main tools were the project evaluation methods based on the determination of shadow prices and social rates of return systematized by Partha Dasgupta, Amartya Sen and Stephen Marglin (1972) in the famous "Guidelines for Project Evaluation" of the United Nations. For sectoral planning - usually the planning of creation or expansion of the so called "key" or "leading" economic sectors"- the mathematical programming tools and activity analysis methods developed by Leonid Kantorovich (1939), Tjalling Koopmans (1942) and George Dantzig (1949) were widely used.

For intersectoral planning, the Input-Output matrix model developed by Wassily Leontief (1941) was the most popular tool. This model gives an empirical approximation to the intersectoral structure of the national economy, and had its historical antecedents in the

Tableau Economique of Quesnay, in Marx's reproduction schemes, and in the method of material balances of Soviet planning. Since this is a linear model without relative prices, it was useful for structural analysis and for projection exercises of the impacts of changes in demand under the assumptions of unemployment of resources, no fixed factors, and no substitution between inputs or between products.

Finally, for aggregate growth planning the main tools were variations of what became known as the Harrod-Domar model (Harrod, 1939). This model was kind of a dynamic extension of some basic ideas developed by Keynes in his General Theory. Essentially, it specifies a core of relatively simple relationships in terms of capital/output ratios, used to determine incremental levels of investment required to achieve a growth rate of output established as a policy goal. A number - sometimes many - of extensions were usually added to that core, including variables relating to production, employment, income distribution, the external sector and the fiscal sector. In terms of practical policy, the most influential model of this type was the RMSM (Revised Minimum Standard Model) of World Bank, born in 1971 and widely used, with some revisions, for several decades. This is an intra-temporal consistency model, including some accounting and behavioral relationships, but with a time consistency between stocks and flows mostly nonexistent.

Intertemporal growth models were also available for aggregate growth planning. However, their application was more difficult. The initial canonical reference of these models is a work of Frank Ramsey (1928) which, according to Keynes, at the time was one of the most important contributions in the history of mathematical economics. Ramsey asked and answered, as a problem of economic planning and policy, the question of how much income a country should save and invest to maximize its welfare in the long term or, in other words, what is the optimal growth rate of an economy. However, his study was well ahead of his time and remained forgotten, even in socialist countries, as its empirical implementation as an intertemporal model of country-level planning required data and computational capabilities that were yet to come. In the meantime, aggregate growth planning evolved along other lines, as we saw above.

Entered the 1960s there were advances in theory and computational methods that resumed Ramsey's work and took it to a higher level of complexity, accuracy and scope. And again this was done keeping in mind the problem of planning the growth dynamics. The initial impetus was given by the work of Jan Tinbergen (1960), Richard Goodwin (1961) and Sukhamoy Chakravarty (1962), focused on planning the optimal growth of

developing economies with significant unemployment of resources, and reached broad theoretical generalization with the work of David Cass (1965) and Tjalling Koopmans (1965). And by the end of the 1960s, David Kendrick and Lance Taylor (1969, 1970) developed a pioneering multi-sectoral computational intertemporal planning model, combining objective, production and nonlinear absorptive capacity functions with linear input-output matrices, and allowing for differential changes in sectoral productivities and also for constraints on the external sector.

Starting in the 1970s, the economic intervention of the state began to be seriously questioned by the “conservative revolution” sustained, at a theoretical level, by the works on “state failures” of James Buchanan, Robert Tollison and Gordon Tullock (1980); by the preaching of Anne Krueger (1974, 1997) against what was then the conventional theory of economic development; and by the policy prescriptions of the Washington Consensus systematized by the influential work of John Williamson (1989). These changes at the level of theory were parallel and, in a way, promoted by major political shifts at the international level. These shifts began with the “demonstration cases” of Chile in 1973 and Argentina in 1976, two ambitious policy experiments of economic openness, deregulation and privatization of public assets. And they started to gain world weight and scope with the change in orientation in China’s economic planning in 1978, the conservative revolutions begun by the governments of Margaret Thatcher in 1979 in the United Kingdom and Ronald Reagan in 1981 in the United States and, finally, with the collapse of the Soviet bloc in 1989.

These processes had, of course, major consequences on the use of planning models and tools at governmental levels, as these tools were replaced by a dogmatic faith in the virtuosity of spontaneous market mechanisms. Not surprisingly, the World Bank began a major shift with the appointment of Anne Krueger as its Chief Economist in 1982, while other international institutions that had advanced along with the World Bank in development planning began a profound transformation. The same happened as many developing countries dismantled or let languish their planning offices, especially in Latin America, as they embarked on ambitious economic policy experiments which became known as “neoliberalism”, an experience that reached its peak in the 1990s.

## 2. Picking up the pieces and looking forward

By the end of the 1990s it became evident that the conservative revolution in development theory and practice had not met expectations. The Asian and Russian crises of 1997, and the resounding collapse of the Argentine experiment in 2001 - the poster child of the world neoliberal policies of the 1990s - brought about a major crisis for the Washington Consensus and significant shifts in economic policy in a number of developing countries, mainly in Latin America, as was the case of Argentina, Bolivia, Brazil, Ecuador, Uruguay and Venezuela.<sup>1</sup>

These changes opened the door for wider discussions in development theory and policy. At the level of theory, the role of the state in economic development gained a new rationale from advances which formalized and refined a number of intuitions of the development pioneers (Krugman, 1995; Meier and Stiglitz, 2001; Ray, 2002; Ros, 2001); from progresses in the new institutional and historical comparative analysis of development, which paid particular attention and studied in depth the path followed by the development of the Asian Tigers (Amsdem, 1989; Evans, 1995; Hollingsworth and Boyer, 1997; Portes and Smith, 2008); and from the prescriptions of the “new industrial policy” in connection with institutional strategies of state promotion of industrial development (Rodrik, 2004; Sabel, 2005).

The advances in knowledge and the political changes just mentioned allow us to revisit the best of the traditions in the universe of development planning, but in the light of the theoretical advances, the historical experiences and the computational tools available today. In this regard, it is convenient to make a stop to attempt a review of the state of the art in terms of models and tools.

Concerning micro economic planning, traditional tools for project evaluation continued to be applied even after the 1980s, albeit in a very limited way since many of those tools implied a deep involvement in economic micro management from the part of the state, something that fell out of fashion due to the significant inefficiencies found in many

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<sup>1</sup> The international financial crisis started in 2008 in the developed countries, and the massive rescue operations implemented by the states of those countries put in the public agenda the issue of the role of the state. However, in these countries the discussion is more about the state as regulator and not so much on the state as an agent of structural transformation.

historical experiences. The development field is today far away from those methods and closer to the use of the new tools for program evaluation, especially those related to the methods of “randomized field experiments” (Duflo et al. 2008). However, these methods have been applied so far to problems closely related to social policy in developing countries (health, education and poverty alleviation) and may not be suitable for projects or programs oriented to the transformation of the structures of production not only in low but also in middle income countries (Rodrik, 2008).

With regard to sectoral programming tools, their application was mostly abandoned by states and international organizations, and kept in use mainly in some cases of major infrastructure projects. However, they continued to be actively applied in the private sector, particularly by large corporations that use them for planning their production, location and distribution strategies. A possible return of the presence of the state in activities related to specific industries, or its active involvement in the development of strategic or leading sectors would require, of course, the application of such tools with the corresponding updates (Kendrick, 1996).

In the cases of intersectoral planning and aggregate growth planning there are now new and more powerful tools, such as computable general equilibrium models and intertemporal growth models. Unlike their predecessors, these models inherently contain or allow for the incorporation of objective functions that enable a more sophisticated analysis of alternative policies; permit the specification of more complex intra and intertemporal consistency and behavioral relationships; make possible the modeling of non linear technologies; and endogenously determine not only quantities but also relative prices.

As mathematical and computational tools, these models are open to various uses based on alternative economic approaches. Regarding the computable general equilibrium models, some of them are more linked with the Neoclassical tradition, such as those derived from the work of John Shoven and John Whalley (1992), in the sense that they tend to pay particular attention to the specification of demand and supply functions derived from the assumptions of utility or profit maximization by consumers and firms respectively; to assume perfect competition; and enforce market clearing. While other models fall more within the Structuralist tradition, paying particular attention to factors such as imperfect competition and binding constraints, as it is the case of those developed by Lance Taylor (1990).

As for the intertemporal models of growth, an important feature of these models is the intra and intertemporal consistency between stocks and flows, particularly significant as the planning horizon extends over time. Indeed, models that ignore this kind of consistency - as in the case of "forward recursive" models where the dynamics stems from the simple accumulation of some factor of production - are at risk of generating paths of short-term growth that seem reasonable but in the medium to long run tend to the complete exhaustion of the stock of capital, the disappearance of consumption, or the explosive expansion of "Ponzi schemes" for the debt. Although these dynamics may be considered as descriptive of the inherent instability of market economies, are obviously unacceptable as desired optimal paths of growth from a planning perspective, which assumes that the social planner is concerned about the sustainability of economic growth and the long run maximization of the country's welfare.

Interestingly, the "conservative revolution" that gained momentum in economic theory since the mid 1970s and began to impose its weight in the early 1980s provoked a sort of change in the meaning of intertemporal models of growth,<sup>2</sup> which from normative models of planning came to be interpreted as descriptive models of the supposedly spontaneous and stable growth process of market economies.<sup>3</sup> However, the same today as yesterday, intertemporal growth models keep their potential to provide conceptual and empirical rigor to counterfactual planning exercises on aggregate growth for the long and very long run.

Also interesting is the relatively recent interest of conventional growth theory in intertemporal multi-sectoral growth models. After being neglected for decades, the issue of the structural composition of growth is now dealt with in a number of multisectoral models developed over the last few years (Acemoglu, 2008; Matsuyama, 2008).<sup>4</sup> The

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<sup>2</sup> This change in meaning is made possible using the known mathematical equivalence between perfect planning and perfect competition, and equivalence that fed the famous debate on the "socialist calculation" between Oskar Lange, Abba Lerner and Friedrich Hayek in the 1920s and 1930s, summarized and updated in a suggestive work of Joseph Stiglitz (1994).

<sup>3</sup> In this line of work, Fynn Kydland and Edward Prescott (1982) began using intertemporal growth models to argue that the economic cycles of expansion and contraction in output and employment are optimal responses of market economies to productivity shocks, and therefore maximize welfare at all times.

<sup>4</sup> As we mentioned earlier, a pioneering intertemporal multisectoral growth model had been developed by David Kendrick and Lance Taylor by the end of the 1960s. For an example on how to implement that model in today's computers using the General Algebraic Modeling System, see Mercado, Lin and Kendrick (2003).



connection between these models and economic development becomes apparent as soon as we remember that economic development means, in a way, structural change, understood as the emergence of new sectors and/or the re-articulation of existing sectors in the economy.

Advances have been made also in connection to the macro-micro relationship in the design of development strategies. Many development strategies were defined at a macro level as a specific combination of relative prices, regulations and interventions, that is, as a set of incentives that were supposed to direct micro behaviors. However, micro behavior in developing economies usually differs from the conventional paradigm in a number of ways, due to problems of imperfect information, coordination failures, agent's heterogeneity and the perception of uncertainty. Thus, it is likely that their aggregate path ends up being quite different from the one expected by policymakers so that, "ex post", their macro incentives reveal themselves as surprisingly inconsistent. This reinforces the need of a policy design that focuses simultaneously on the macro and micro levels when dealing with development policies, since a consistent and stable macro does not seem to be enough to induce development (Ocampo, 2005; Cimoli, Dosi and Stiglitz, 2009).

### **3. News on the front: uncertainty and institutions**

Sophisticated methods of sectoral programming, as well as the tools to develop large computable general equilibrium and intertemporal growth models are now available to any government or international organization with a minimum of technical capacity need to use them. So are the computational tools to make them operational (Kendrick, Mercado and Amman, 2006). However, there is still a paucity of information necessary to feed them. There have been advances in international and local generation of data and in the estimation of variables and structural parameters of the economy of many developing countries, but there are still many gaps to fill.

There are also new methods and tools that help transcend some ingenuity implicit in the traditional tools of planning. In the first place it is worth mentioning the methods and model useful to deal with the uncertainty that characterizes the economic universe, especially in the developing countries, and particularly in a contemporary world marked by sweeping megatrends of change.

There are several ways of thinking and dealing with uncertainty. Classical and Bayesian Econometrics applies to situations in which uncertainty is quantifiable, that is when we have events which are fairly regular and display little structural change, or when we have substantial information and when learning is relatively easy. In these cases, uncertainty can be measured by probability distributions, is of a "cardinal" nature.

To apply to these cases in a planning context there are now numerous mathematical methods and computational tools. In relation to computable general equilibrium models, it is now possible to make multiple stochastic simulations to test the robustness of the models to changes in policy variables or in the structural parameters of the model (Harrison et al., 1992, 1993).

In relation to intertemporal planning, the methods of Stochastic Control (Kendrick, 2005) and the ones of Robust Control (Hansen and Sargent, 2007) provide high-powered and sophisticated instruments. In both methods the social planner goal is represented by means of an intertemporal objective function measuring the deviation of the time paths of a number of selected policy goals with respect to their desired or planned paths. And also in both methods the time paths of the policy goal variables are generated by the state-space representation of the dynamic structure of the economy.

Stochastic Control methods are able to deal with a variety of forms of uncertainty with increasing degrees of sophistication (Kendrick and Amman, 2006). Thus, additive uncertainty, measurement errors and parameter uncertainty can be dealt with using certainty equivalent methods, with a number of passive and active learning methods, or with dual control methods. Robust Control methods are used when there are doubts about the validity of the specification of the model used and the planner wants to take precautions, making policy decisions that are robust to a set of possible models that are assumed to be more or less close to the model specified. In this case, the planning problem may be seen as a zero sum game between the policy maker and "nature", where the policymaker tries to minimize the deviations of the objective function through the optimal use of the policy instruments but faces "nature" that tries, in a malevolent way, to maximize these deviations.

The methods mentioned so far assume that the uncertainty emerging from or surrounding the economic system can be represented by means of probability

distributions. However, there are contexts in which events have very little regularity, there are significant structural changes, or little information can be stored or accumulated. This makes uncertainty difficult or impossible to measure, and this implies that probability distributions can't even be defined. In these cases, we can't quantify the level of uncertainty, but we can make "ordinal" subjective judgments, ordering events in terms of more or less likely.<sup>5</sup> But in extreme cases we couldn't do even that.<sup>6 7</sup>

One way to introduce the concept of "institution" is to present it as a mechanism to bound uncertainty (North, 1990). Institutions are "rules" that specify permissible behavior patterns. Therefore, institutions help to limit the uncertainty that would result from millions of possible patterns of behaviors without any regulation. From here then opens another way of thinking in development planning. Indeed, the methods mentioned so far assume as given certain institutional frameworks within which they seek to optimize social outcomes. But there are instances where it is necessary to define or redefine the rules of the game designing institutions ("mechanisms") to optimize social welfare. In so doing, economic agents are no longer seen as passive agents that respond to quantitative stimuli decided by the planner or policy maker, and come to be understood as active agents with private information that interact strategically with each other and with the planner, anticipating her movements. Game Theory and, more recently, Mechanism Design Theory (Maskin, 2007) enter the planner's toolbox, who begins to play the role of an "Institutional Engineer" bringing together insights and methods from Game Theory, Experimental Economics and Computational Economics (Roth, 2002). The scope and potential of these tools is wide, and some of the most notorious practical achievements have been made in the design of specific markets and in the engineering of complex

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<sup>5</sup> Hicks (1979), Chapter 8, discusses the use of the probability concept in economics.

<sup>6</sup> Davidson (1996) postulated the "non-ergodicity" of economic processes: they would be impossible to represent by means of probability distributions. Schakle (1972) suggestively analyzed the relationship between uncertainty and economic policy in the context of what he named "Kaleidic Economics".

<sup>7</sup> These questions refer us to long standing discussions, dating back to Knight (1921) and his differentiation between measurable "risk" and not measurable "uncertainty"; the criticism of Keynes (1939) to Tinbergen (1937) around macroeconometric modeling; and the corresponding response of Haavelmo (1943). The echoes of these discussions will continue playing until today.

public auctions. However, its widespread application in the field of development is yet to come.

But there is sometimes a certain amount of ingenuity in the field of institutional engineering when trying to give it universal reach. On many occasions, the agents we model are not only rational and selfish agents with strategic vision and asymmetric information. They are also opportunistic predators permanently rent-seeking by all possible means, even if they involve the violation, alteration or destruction and change of the rules of the game (Williamson, 1985) or of their own identity (Akerlof and Kranton, 2007). And the problem is that this characterization may sometimes apply not only to private agents, but also to public ones, that is, to the development planners.<sup>8</sup>

Not much more can be said about these issues from the standpoint of planning methods and tools, whether in terms of quantitative planning or in connection to institutional design. Those tools assume, explicitly or implicitly, the existence of an ultimate planner, or a government, which is "benevolent" in nature. However, we should always keep present in the back of our minds the scope and the limitations of this assumption. During the golden years of development planning, the existence of a homogeneous state apparatus willing to and capable of applying the existing planning tools in a benevolent and efficient manner was something taken for granted. Today's situation is quite different.

Contemporary thinking about development policies tends to emphasize that the imposition of new development strategies in an old state apparatus without advancing changes in its organizational structure is generally a recipe for failure. In that sense, some lines of research (Evans, 1995) emphasize that the state bureaucracy in charge of development policies should not be an isolated entity but embedded in strong ties with society through institutional channels that facilitate the continuous negotiation and renegotiation of goals and policies and enable the decentralized implementation of initiatives. Effective developmental states then combine well developed internal bureaucratic organizations with strong public-private ties: they have an "embedded

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<sup>8</sup> Nor should we lose sight of the fact that individuals and institutions, including the state, are embedded in broader social contexts and generally "over-determined" by them. This brings us to the gates of hell, that is, to the field of Political Economy, or even to Sociology!!! (Granovetter, 1985; Hollingsworth and Boyer, 1997; Portes and Smith, 2008).

autonomy”.<sup>9</sup> Other lines of research (Rodrik, 2004; Sabel, 2005) point towards the need of identifying, within the existing state apparatuses, specific well functioning institutions to be used as starting points from which to expand a given development strategy by means of the progressive building of links or alliances with an increasing number of areas of the state.

#### **4. Conclusion**

The recent crisis of the Washington Consensus has brought with it the return of the involvement of the state in the development process in a number of countries. However, a lot of water has run under the bridge since the golden years of development planning. We reviewed the main methods and tools of development planning applied during those years, we evaluated their contemporary relevance, and we discussed the potential usefulness of newer tools to deal with some essential characteristics of the development process such as intertemporal dynamics, uncertainty and institutional innovation.

Along the way, we reviewed of the theoretical and political changes that went along with the ups and downs of development planning. New and sophisticated tools are available today to facilitate the strategic coordination, orientation, or direction of the development processes in developing countries. The degree of their effective application will depend on the consolidation of the ongoing political changes at the international level; the incidence of these changes on the development practice of the main international organizations related to development issues; and the progressive consolidation of state apparatuses of increasing technical capacity in those developing countries that, after experimenting and failing with the so called “neoliberal” policies, are looking for smarter ways of reaching higher stages of development.

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<sup>9</sup> This kind of “developmental state” is opposed to the “predatory state”, a state lacking mechanisms to prevent government officials from pursuing their individual goals, and where their individual maximization takes precedence over the pursuit of social goals. Several South Asian states are mentioned as examples of developmental states, while a number of African states are taken as examples of predatory ones. Most Latin American states are considered as combining features of varying degrees of predatory states and developmental states.

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