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Complementarity and institutional change in capitalist systems

Richard Deeg

ABSTRACT The concept of institutional complementarity – that the co-existence of two or more institutions enhances the functioning of each – is frequently used to explain why institutions are resistant to change and why introducing new institutions into a system often fails to achieve the intended objective. This paper utilizes examples from comparative political economy to delineate the concept and address the issue of how to measure the strength of complementarities. It then assesses the utility of the concept for explaining institutional change, concluding that assessing the causal effect of complementarities on change is difficult and ambiguous. A better understanding requires embedding complementarities within a more general theory of institutional change which takes a broader view of the ways in which institutions interconnect and change.

KEY WORDS Complementarity; institutions; political economy; varieties of capitalism.

The concept of complementarity has rapidly gained significance within institutionalist theory.¹ The core idea of complementarity is that the co-existence (within a given system) of two or more institutions mutually enhances the performance contribution of each individual institution – in essence, that the whole is more than the sum of its parts. The concept has been applied across a wide range of institutional spheres and levels, from the macroeconomy (Franzese 2001) to individual firms (Milgrom and Roberts 1995), from welfare regimes (Bettio and Plantenga 2004) to policing (Den Boer 2002). Complementarity is also increasingly used to explain why institutions are resistant to change and why introducing new institutions into a system often leads to unintended consequences or failure to achieve the intended objective. But institutional change does happen and, logically, if complementarities exist then the process of change must be shaped in some way by them. Thus the ultimate objective of this paper is to analyze the utility of the concept of complementarity for understanding change. The empirical references in this paper are to the role of complementarities in constituting capitalist systems and in shaping their

recent institutional change, though much of the discussion should be relevant to institutional analysis in general.

What is common to all conceptions of complementarity is the core idea that the co-existence of two (or more) institutions together affects the strategic choices of actors and/or will enhance the ability of actors to achieve their objectives. Indeed, it is the very existence of complementarity that makes the whole notion of distinct systems or models of capitalism plausible, since complementarity presumes that there are a limited number of ways to combine institutional elements successfully.

If complementarities enhance actors' capacities (or increase returns to them) then we can readily assume that the institutions that create complementarities will be all the more resistant to change, i.e. any pattern of institutional change will be influenced by the desire of actors to maintain (or obtain) the institutions that generate complementarities. A well-developed theory of complementarity, then, should generate predictions about patterns of institutional change in national economies. In the recent literature on comparative institutional political economy, complementarity has become a central concept (e.g. Aoki 2001; Milgrom and Roberts 1995; Höpner 2005). For example, the theory of Hall and Soskice (2001) divides advanced capitalist economies into two primary types – coordinated market economics (CMEs) and liberal market economies (LMEs) – and predicts that when confronted with pressures for change, liberal market economies will get 'more liberal' and coordinated market economies will resist liberalization in order to sustain complementarities. More recent work on path dependency (e.g. Pierson 2004; North 1991) also argues that the existence of complementarities among institutions inhibits change, i.e. reinforces a given institutional path by generating increasing returns to actors. In this case complementarity leads to predictions not of specific outcomes, but of institutional stasis or stability (until overwhelmed by other forces).

While the basic argument of complementarity is appealing and intuitive, in reality its utility for explaining change is less than straightforward. Thus this paper has two primary goals. The first is to address the issue of how to measure the strength or 'binding force' of complementarities. The second is to assess the utility of institutional complementarities for explaining observed patterns of change in contemporary capitalist systems. In the end, I believe that while institutional complementarities are significant, assessing their causal effect on institutional change is difficult in most instances and ambiguous. A better understanding requires that we embed complementarities within a more general theory of institutional change which takes a broader view of the ways in which institutions interconnect.

UNPACKING THE CONCEPT OF COMPLEMENTARITY

Before turning to the issue of measuring complementarities, it is essential to unpack the concept and to differentiate it from other patterns of institutional

linkages that may appear to an observer as complementarity but in fact are not (for similar analyses see Boyer 2005; Höpner 2005).

Institutional **complementarity** exists when the performance of an actor (e.g. a firm or national economy) is enhanced by the co-existence or conjunction of two (or more) specific institutions. I suggest it would be useful to break complementarity down into two forms:

- 1 Complementarity in the form of *supplementarity* in which one institution makes up for the *deficiencies* of the other (i.e. provides a ‘missing ingredient’), thus raising the returns to actors from the first institution (Crouch 2005a, 2005b).² For example, when strong familial social support networks offset the vicissitudes of a highly liberalized labor market, thus making the latter more socially and politically acceptable while allowing the society to gain the advantages of a liberal labor market.
- 2 Complementarity in the form of *synergy*. This embodies the mutually reinforcing effects of compatible incentive structures in different subsystems of an economy. Isomorphic institutions are likely sources of this form of complementarity. Assume a given individual economic actor – such as a firm – operates in many subsystems of the economy; if the incentive structures across these subsystems reinforce particular strategies by that actor, they complement by a logic of synergy. Complementarity in the form of synergy may arise through deliberate strategic coordination by actors across institutional domains – Aoki (2001) calls this ‘strategic complementarity’ – or it may arise through evolutionary (functional) selection or isomorphic change (see also Boyer 2005; DiMaggio and Powell 1991).

Institutional **coherence** refers to a situation in which institutions share common or identical principles, which may facilitate interaction among actors operating under them (i.e. institutional isomorphism). Yet this does not necessarily improve measurable performance. Thus coherence may or may not create complementarity (see also Amable 2003: 6–7). Nor is coherence a necessary condition for complementarity, as the notion of supplementarity reflects a situation of incoherence producing complementarity. Coherence may emerge from common historical origins or through a process of isomorphic change, as actors adopt similar institutional solutions to different spheres of action (DiMaggio and Powell 1991; Streeck 2005).

Institutional **compatibility** exists when a set of institutions are stable without being coherent or complementary. In other words, their coexistence does not undermine or weaken the performance of the other but neither does it enhance the other in any way.

Boyer (2005) also highlights institutional **clustering**, in which two or more institutions are frequently observed together across a larger set of case comparisons. Clustering might well reflect the effects of complementarities but not necessarily, since some clusters may be relatively inefficient. In sum, complementarity, coherence, compatibility, and clustering are distinct forms of institutional linkages and must be analyzed as such.

MEASURING COMPLEMENTARITIES

If the concept of complementarity is to be truly useful, we must first consider the question of how to measure the strength of complementarities. Indeed, I think there is no single answer to this question, as it will depend upon the theory of complementarities one adopts which in turn specifies the mechanisms which create complementarity. It will also depend upon a variety of assumptions one makes. For instance, complementarity operates at different levels, ranging from the macroeconomy to individual organizations and small groups of actors operating in distinct domains.³ It is conceivable that a given institutional arrangement will have strong complementarities for a narrower group of actors in the economy but only have weak complementarity gains for the economy as a whole (Hall and Gingerich 2004). Or, as Boyer (2005) notes, an institutional arrangement that is complementary for firm owners may not be complementary for its workers. In such instances there is no single measure of the strength of the institutional complementarity under study and the existence of complementarity will depend upon (a) the referent subject and (b) the performance criteria one selects. Selecting performance criteria also grows more challenging when the complementarity of interest is social (e.g. trust, cooperation) or political (e.g. power) in nature.

It is important to remember as well that complementarity is a causal effect or outcome. Thus we cannot measure it directly but must rely on causal inference. Ultimately the notion of complementarity rests on a counterfactual argument – that in the absence of the presumably complementary institution, then, *ceteris paribus*, the returns to actors or efficiency gains would be lower. Nonetheless, we have a large variety of methods at our disposal for attempting to measure complementarities, ranging from multivariate statistical tools to comparative case study methods. In the discussion to follow I will suggest that different methods may have certain advantages over others, depending upon the level of complementarity one seeks to measure or depending upon one's definition of complementarity.⁴

Finally, one also needs to make an assumption as to whether complementarity is a continuous or dichotomous variable (see also Amable 2003: 62). If one takes the metric of complementarity to be efficiency gains, for instance, it is in principle a continuous variable. However, in reality it may be that gains from complementarity must meet a minimum threshold before they matter. Thus, for example, actors may not seek to create or exploit institutions in neighboring domains for only minor efficiency gains, instead requiring some minimum (at least anticipated) return before investing resources in exploiting the potential complementarity. In this case complementarity may take on an essentially binary character. Even where complementarity is continuous, measurement difficulties often make a binary approach attractive.

Perhaps it is easiest to start with the issue of measuring complementarities at different levels of the political economy (see Table 1). If we start with an economic efficiency or increasing returns conception of complementarity, then we

Table 1 Measuring institutional complementarity (IC) in the economy

<i>Level/ Dimension</i>	<i>Sources of IC</i>	<i>Performance effects</i>	<i>Measurement methods</i>
Macro	National institutions <ul style="list-style-type: none"> • industrial relations • corporate governance • training/skills • finance 	GDP growth, innovation, productivity, employment	Regression analysis (e.g. Hall and Gingerich 2004; Kenworthy 2006) Boolean analysis (e.g. Boyer 2004)
Micro:			
–Institutions	Corporate governance: e.g. <ul style="list-style-type: none"> • proxy voting • equity ownership • board seats • private information 	<ul style="list-style-type: none"> • investment in specific assets (skills) • 'patient capital' 	Boolean analysis (e.g. Jackson 2005) Case studies (e.g. Molina and Rhodes, forthcoming)
–Sectors	Sectoral institutions: e.g. <ul style="list-style-type: none"> • inter-firm relations • training • standards • associations 	Sectoral growth, innovation, productivity, employment	Regression and Boolean analysis Case study (e.g. Casper and Whitley 2004)
–Actor	Firm-relevant institutions: e.g. <ul style="list-style-type: none"> • human resource • production organization • financing • training 	Firm growth, innovation, productivity, employment	Regression and Boolean analysis (Crouch 2005a) Case study (e.g. Milgrom and Roberts 1995)

have some relatively straightforward means to measure complementarities at different levels of the economy. In this case we can utilize any number of performance indicators as our dependent variables. At the macro level, we can attempt to measure complementarities utilizing measures such as productivity gains, innovation (e.g. patents), or gross domestic product (GDP) growth. At the micro level – that is, identifiable groups of actors within the economy (e.g. firms or sectors) – we can use profitability, revenue growth, etc.

For example, Hall and Gingerich (2004) attempted to validate the primary hypothesis of the widely cited varieties of capitalism (VOC) framework (Hall and Soskice 2001). Using the core institutions identified in the VOC approach,

their study found a clear and internally consistent clustering of economies into CME and LME types, along with some in the mixed category. These were then correlated with GDP growth over the past two decades and, consistent with the predictions of VOC, economies with high levels of internal institutional consistency – i.e. exhibited the institutional patterns argued to generate complementarities – exhibited higher growth rates than those with lower consistency. In other words, the more ‘pure’ a system was (whether LME or CME), the better it performed, presumably as a result of the complementarities.

An alternative approach to measuring complementarities at the macro level is demonstrated by Boyer (2004). Boyer uses a Boolean approach to assess the association between various institutional features and selected macroeconomic performance measures. Applying this approach to a range of Organization for Economic Cooperation and Development (OECD) countries, Boyer identifies three successful combinations or clusters of institutional features that produce superior macroeconomic outcomes. He concludes that ‘the common feature is clearly the systemic complementarity between the coordination mechanisms governing the creation and diffusion of knowledge’ (Boyer 2004: 15). In contrast to Hall and Gingerich, who treat complementarity as a continuous variable, Boyer’s method treats it as dichotomous variable.

However, while these are noteworthy efforts to measure the strength of complementarities, they are still insufficient. First, there are undoubtedly other factors that affect macroeconomic performance and not all of these are controlled for in these studies. This is manifestly obvious in Hall and Gingerich’s diachronic test in which they find a weakening correlation between institutional complementarities and growth over time without any measured change in the complementarities themselves. The authors are hard pressed to explain this when the institutions which they believe generate these complementarities have not, in their view, undergone major change. Kenworthy (2006) also replicated and extended this study but could not find a systematic correlation between institutional complementarity and economic performance.

Second, numerous studies (e.g. Paunescu and Schneider 2004; Castles *et al.* 2006) provide evidence that many of the institutions examined by Hall and Gingerich have, in fact, changed quite substantially in many advanced economies. Specifically they show a widespread movement among economies from coordinated toward liberal market institutional arrangements with many cases now encompassing features of both systems. If the VOC theory of complementarity is correct, this change should result in declining performance but supporting evidence for this is not there. In a study of Denmark, for example, Campbell and Pedersen (2007) provide evidence that Denmark’s partial move from coordinated toward liberal market arrangements actually improved socio-economic performance by increasing complementarity in the form of supplementarity.

Third, the macro approach generally obscures whether the institutions that generate complementarities might evolve or change over time, or whether existing institutions have been replaced by new ones while still generating

complementarities at the macro-level. For example, complementarities at the macro level might be sustained over time by micro-level institutional changes. Simply focusing on the aggregate level would mislead us into believing in the robustness of the underlying institutional configuration while, in fact, it is changing in ways that may ultimately undermine complementarities. As Boyer (2005) notes, complementarity between a given set of institutions is likely to be context dependent, i.e. other institutions, norms, etc. may be essential antecedent conditions. For example, an 'insider' system of corporate governance may well have been complementary with relational banking in a context of low mergers and acquisitions among firms, but in an era when mergers are abundant, these institutions may no longer be complementary because they inhibit the issuance of shares and a high share price that can be used to acquire other firms.

A fourth gap left by the macro approach is knowledge about sectoral differences in complementarity. It is easily argued that some sectors within a given economy may profit from extant institutional complementarities while others may not. For example, in the coordinated market economies of the VOC schema, the machine tool sector seems more likely to gain than does the software sector, since the former relies on the incremental innovation favored by strategic coordination and the latter typically does not. The macro approach just tells us the sum of complementarities across all firms/sectors, not its distribution. In sum, demonstrating the impact of presumed institutional complementarities on macro performance measures is elusive. Yet even where credible evidence can be generated, the macro approach still provides little guidance as to the specific causal mechanism at work. For this we need micro approaches.

ASSESSING COMPLEMENTARITIES AT THE MICRO LEVEL

In this paper I suggest we attempt to measure complementarity at the micro level along three dimensions. The first is to identify and assess the specific *institutions* which generate complementarities and attempt to assess or measure their respective strength. The second is to assess by economic *sector* the strength of complementarities. The third is to assess *actor-specific* complementarity. Some specific methods employed might be a quantitative analysis, a comparative case study analysis, or a Boolean analysis à la Boyer.

Measuring by institutions

It we take institutions first, there are two levels which we need to study.⁵ The first is the relative significance within a given domain (e.g. industrial relations) of specific institutions (e.g. wage bargaining institutions, employment protection laws) for generating complementarities with other domains.⁶ The second is to assess the relative importance of complementarities created between different sets of domains or spheres. In other words, do the complementarities generated between corporate governance and industrial relations contribute more

to aggregate economic performance than the complementarities between the industrial relations system and the training system?

On the first level, we can take the example of complementarities between corporate governance and labor relations systems. Hall and Gingerich, for instance, attempt to measure complementarities among corporate governance variables – shareholder power, dispersion of control, stock market size – and labor relations variables – level and degree of wage coordination, and labor turnover – that are predicted by the VOC theory to generate complementarities.⁷ Most of these are actually structural indicators of several specific underlying institutions, including both formal (codified) and informal ones, and it is discerning which of these institutions really generate complementarities that we seek to isolate here. In the case of CMEs they posit that complementarities arise when these institutions facilitate credible commitments by actors to long-term strategies and strategic coordination based on investment in specific assets. In particular the more institutions facilitate four actor capacities – information exchange, monitoring, sanctioning, and deliberation – the stronger the complementarity that exists. There are two empirical questions here, then; the first is whether the institutions theoretically specified are actually the ones to create complementarity? For example, the VOC perspective posits that bank monitoring of firms facilitates ‘patient’ capital. This monitoring occurs because banks, through proxy voting, control of board seats, equity investments and loans to firms, are in a position to receive private information about firms and thus make long-term capital commitments. These institutions combined complement with labor institutions such as job security to facilitate high levels of investment by workers and firms in skills and especially firm-specific skills.

But if bank monitoring via board seats were removed, is another institution such as concentrated ownership sufficient to maintain complementarities? In Germany, for example, many of the institutions associated with patient capital have eroded, yet so far there is no clear evidence that firms and workers are systematically reducing investment in training and specific assets. Thus until we can answer such questions we do not in fact know exactly which institutions – or combinations of institutions – within a specific domain are actually responsible for generating complementarities with other domains. Moreover, it is also plausible that within a domain specific institutions might diminish, be replaced or supplemented by other institutions over time yet still maintain the complementarities measured at the macro level.

The Boolean approach employed by Boyer might be a good method for this challenge. One could, for example, devise a study that codes economies on the level of bank monitoring, ownership concentration, sources of corporate finance, etc., and then code them according to success or non-success on performance measures. The Boolean approach would identify which of the specific institutions (monitoring via boards, concentration) actually seem essential to performance success. Jackson’s (2005) study actually takes the first step in this direction: he uses a Boolean approach (qualitative comparative analysis – QCA) to identify common clusters of corporate governance institutions (*inter alia*,

dispersion of ownership, investor rights, accounting rules) and labor institutions (employee representation in boards of directors, employment protection law, centralization of collective bargaining). His study finds a more diverse range of coherent institutional clusters than posited by the strict dichotomy of the VOC framework. This implies that a wider range of institutional combinations are capable of generating complementarities. Measuring actual complementarities would require the next step which is to correlate the observed clusters with performance outcomes.

A case study approach can also be useful for assessing the relative strength of specific institutions for generating complementarities across institutional domains. Molina and Rhodes (forthcoming), for example, explore in detail the key institutional complementarities in the Italian and Spanish economies. While they do not attempt any quantitative assessment of complementarities, their study provides indicators of the relative strength of various institutions by examining how significant specific institutions are in shaping the process of change.

The other issue raised by the 'patient capital' example is how we might assess or identify the actual causal mechanisms which link institutions to outcomes. In this example, is the act of monitoring by one actor of others that which actually facilitates their coordination and credible commitments? Ultimately one should be able to demonstrate and measure the extent to which actors exchange information, monitor, sanction, etc., and then demonstrate that this enhanced efficiency. It seems to me that the best method for assessing such actions is through careful case studies of firm behavior over time. For example, bank monitoring can be assessed via numeric indicators such as corporate board seats held by banks combined with studies of bank intervention in other firms. One could then compare firms that are highly engaged in monitoring networks, etc., versus those that are not. If these behaviors exist and generate complementarities, this should be evidenced in superior performance outcomes.

The second level at which we may attempt to assess institutional complementarity is the relative importance of different institutional domains in generating macro performance. Are complementarities between corporate governance and industrial relations more important to overall economic performance than, say, complementarities between labor relations and the training system? One of the difficulties with attempting to make such a measurement is that it may be hard to get enough variation on these variables, since strategic or market coordination tends to be uniform across domains within a given economy. If this is true, quantitative approaches are not likely to work well. Some possibilities to explore this level, however, do exist. For example, in Germany corporate governance has arguably become more market oriented while the industrial relations system remains coordinated (Beyer and Höpner 2003). If, then, it can be shown that the demise of coordination within corporate governance has not diminished firm performance, it would be an indicator that either there were no complementarities to begin with, or that the complementarities that existed did not arise from the presumed institutions fostering monitoring, etc., or possibly that complementarities have been recreated through new institutions.

Measuring by sectors

Much of the comparative institutional political economy literature focuses on the nation as the unit of analysis. In such cases the general tendency is to assume that national institutions distinguish varieties of capitalism and determine the characteristics at the sectoral level (e.g. Hall and Soskice 2001; Whitley 1999). In other words, sectoral differences are downplayed in favor of national differences. Yet there are many studies which demonstrate patterns of sectoral organization and institutions that deviate substantially from national patterns. For example, the high-tech clusters/sectors of Silicon Valley exhibit many institutional features not normally considered emblematic of the market-driven American national model (Crouch 2005b; also Casper and Whitley 2004).

A second reason for measuring complementarity at the sectoral level is that changes in sectoral composition of the economy will affect our measurement of complementarity. In coordinated market economies, for example, retailing seems far less likely to benefit from a coordinated training system or patient capital than the auto sector, since the former requires relatively modestly skilled labor and the latter relies more on the skilled labor presumably generated by the complementarities among these institutions. If this were the case, then if the economy were to shift away from sectors like auto toward retailing, a pure macro approach might measure declining aggregate gains from complementarity when in fact those complementarities still remain strong for the auto sector. Thus declining macro performance would result not from declining complementarities but a shifting composition of the economy. Hall and Gingerich invoke just such a scenario as a possible explanation for the declining complementarities they observe over time (2004: 30). Knowing which sectors benefit from complementarities and by how much also has obvious import for policy-makers concerned with overall growth. More generally, a better understanding of institutional complementarities promises to enhance the making of effective policy – especially when it comes to institutional reform – and projecting the effects of policy changes.

Sectoral analysis can also be defined and examined not by product or service sector but by firm size. There are ample reasons to believe that institutions which generate complementarities for large firms may not do so (or not to the same degree) for smaller firms (see also Paunescu and Schneider 2004). Or, a set of institutions which generates complementarities for large firms will require the presence of other institutions in order to generate similar complementarities for small firms. For example, the combination of strong unions and centralized wage bargaining systems that limit wage spread works to the advantage of large firms but not for smaller firms – unless the latter category is somehow otherwise compensated through other institutions.

Measuring by economic actors

As already noted above, complementarity is ultimately a phenomenon that exists relevant to a specified entity that benefits from it. While this entity can be a

national economy, it is potentially more tractable and perhaps more useful to assess complementarities as they are generated by a set of institutions for specific actors (Deeg and Jackson 2007). Firms as organizational actors are the obvious choice, though other collective actors such as unions could also be the subject of study. Earlier work by Milgrom and Roberts (1995) established a theoretical basis for the existence of firm-level complementarities, though stopped short of providing a method to estimate numerically the strength of such complementarities. One approach to measuring firm-specific complementarities is regression analysis between firm-level performance indicators and institutional variables. One difficulty with this is that if all firms within a nation face the same institutional environment, one would expect that all firms in a given sector would have essentially the same level of complementarities, i.e. there would be little variation in the independent variables. To get around this one would need to identify firm- or sector-specific institutions that interact with national institutions to generate firm-specific complementarities (as Milgrom and Roberts do), though this still leaves other methodological issues to be solved. Moreover, the more firm-specific complementarities are generated by firm-specific institutions, the less such studies would tell us about the level of complementarities at the sectoral or national level.

A somewhat different approach to this issue takes up an emerging view in the comparative institutional literature that firms are not simply 'institution-takers,' as the VOC framework suggests, but have considerable leeway to selectively utilize institutions external and internal to the firm, thus generating unique complementarities for themselves (e.g. see Morgan 2005; Crouch 2005b; Hancké and Goyer 2005). Here it also becomes advantageous to return to the distinction made earlier between complementarity in the form of supplementarity and in the form of synergy. Crouch (2005a, 2005b) has proposed an approach for assessing supplementarity using an essentially Boolean approach to assess the existence of actor capacities in a given institutional domain, and then ascertaining whether other capacities not present in this domain yet potentially (or occasionally) useful to actors in the first domain are available in other domains. Thus actors can potentially tap into such capacities when the need arises, in turn producing positive complementarities. This conception is more amenable to individual inductive case study and small-n comparisons of firms in the same sector but with variation in their institutional practices.

We can illustrate this conception using the case of the Deutsche Bank in Germany, long the country's largest bank and seen as a central actor in its system of patient capital. In the 1980s the complementarities (economic rents) generated for the bank's commercial banking strategy by Germany's system of patient capital began to decline for a variety of reasons, including increased corporate transparency and shifts in corporate finance practices. In response the bank sought to reconstruct both national and firm-specific institutions that would generate new complementarities around its new strategy of investment and corporate banking (Deeg 2005). At the national level, this strategy involved efforts to expand securities markets. At the firm level, specific

institutional changes included withdrawing from corporate boards and reducing levels of equity investment in specific firms. One of the firm's major moves in this new strategy involved the kind of complementarity (supplementarity) highlighted by Crouch; namely, in 1989 Deutsche Bank purchased the investment banking capacities it lacked by acquiring a British bank.⁸

COMPLEMENTARITY AND INSTITUTIONAL CHANGE

On its own the concept of complementarity gives us important insight into a key source of institutional functionality and the logic of systems. If, indeed, complementarities among institutions are as common as widely presumed, our theories of institutional change should also recognize this. But how useful is the concept of complementarity for understanding institutional change? To be useful for theories of change, the concept of complementarity should lead to testable hypotheses. Here I begin by identifying five general hypotheses that can serve as the basis for specific hypotheses regarding the set of cases studied.

- 1 The most obvious hypothesis is that if complementarities among institutions exist, then change in one institution should precipitate change in complementary institutions. If one also subscribes to the concept of institutional hierarchies (e.g. Boyer 2005; Amable 2003),⁹ this knock-on effect should be even stronger if the change occurs in the hierarchically dominant institution or institutional domain. Conversely, if hierarchies exist, then changes in subordinate institutions or domains should have little or modest effect on the dominant institution and more generally the whole set of complementary institutions. This hypothesis does not predict the direction of change, i.e. the secondary responses to the initial change may restore the prior functional complementarity, or they may constitute a shift in the whole system to new complementarities.
- 2 The stronger the complementarities among a set of institutions, the more likely those institutions are to remain stable. This hypothesis rests on the assumption that actors will actively resist changes to the institutions that deliver increased returns or functionality to them. Actors will only support institutional change if the potential payoff (weighted for the anticipated certainty of achieving them) from an alternative institutional system is relatively high. This hypothesis is strongly represented in the work of Hall and Soskice (2001; see also Hall and Gingerich 2004; Schmidt and Spindler 2002).
- 3 If central coordination of actors engaged in changing a complementary set of institutions is absent, change in one or more of the institutions will weaken complementarity of the system as a whole. This hypothesis rests on the presumption that institutional change resulting from adaptations by individual actors will be unlikely to coordinate with adaptations being made by other individual actors in a manner that sustains optimal complementarity (see Milgrom and Roberts 1995). If this hypothesis is valid, it also suggests another reason why changing institutional systems with strong complementarities will be

difficult – the lack or weakness of a central coordinator. At the micro level of an individual firm, it is easier to imagine that a central coordinator (management) can coordinate change across the set of institutions that generate complementarities for it. However, if we move to the sectoral or macro level, it is equally easy to imagine the difficulty of coordinating change (see also Streeck 2005; Boyer 2005). The potential for central coordination at this level will depend, *inter alia*, on the role of state actors and the structure of the decision-making process for reform (for a good example see Molina and Rhodes, forthcoming).

- 4 In a system of complementary institutions, once change begins, the upward (strengthening of complementarities) or downward (weakening) movement tends to continue. This hypothesis derives from the notion of complementarity as ‘supermodularity,’ i.e. when raising the value of one variable (institution) raises the returns to increasing the value of a complementary variable (institution) (see Milgrom and Roberts 1995). Thus once change is introduced into the set of complementary institutions, self-reinforcing processes will strengthen that direction of change unless otherwise counteracted.
- 5 If complementarities are strong, then actors promoting change from one system to another must achieve a critical mass of change across the relevant set of institutions within a relatively short period of time if the change effort is to succeed (see Schmidt and Spindler 2002; Milgrom and Roberts 1995). This presumes that actors will accept temporary reductions in complementarities (functionality) if they believe that the new, superior system will be in place within an acceptable time period. If change is too slow and piecemeal – a typical pattern when change involves political processes – actors are more likely to abandon the effort to move from one system to another. An example of this might be taken from contemporary efforts in Europe to transform corporate governance systems from continental ‘insider’ systems to Anglo-Saxon ‘outsider’ systems. Many countries have altered or shifted elements/pieces of their corporate governance system, but few have shifted all; accordingly the process and direction of institutional change in many cases remains ambiguous and politically contested.

Ontological divisions

How one utilizes (and measures) the concept of complementarity in explaining change is determined most importantly by which general model of institutions and institutional change one adopts. Simplifying a bit, there are presently two basic approaches to institutional change within the institutionalist literature (see Streeck and Thelen 2005 for more discussion): the first approach I call the equilibrium-functionalist and the second, the historical-political. The equilibrium approach characterizes rational choice institutionalism and also most path dependency theories. In this approach institutions represent self-enforcing equilibria that change as a result of exogenous shocks. Thus these theories see institutional change as occurring through breakdown and replacement

(‘punctuated equilibrium’) of institutions.¹⁰ In this approach complementarities often help stabilize an equilibrium by raising the cost to actors of changing an institution (e.g. Aoki 2001: 233–5). The common assumption of a competitive environment among institutions means that those institutions which do not generate complementarities for others are selected out of the environment (Morgan 2005). When an institution breaks down, this perspective predicts that other institutions will be changed by actors in an effort to restore or establish new complementarities. In this approach complementarities are analytically central and relatively straightforward in their effects.

A good example of this approach is provided by Hall and Soskice (2001). They hypothesize such strong complementarity that systemic transformation of advanced capitalist systems is very unlikely, even under conditions of Europeanization and globalization. This view allows for two possible patterns of institutional change, either marginal institutional change or wholesale change in the system. The latter scenario comes into play if one subsystem, say the financial system, is so radically altered (breaks down) that – because of strong complementarity – it brings on radical institutional changes in other subsystems in order to establish new institutional equilibria and complementarities. Working in this paradigm, Vitols (2005), for example, reviewed changes in the German financial system and argued that despite a wide range of institutional reforms the financial system broadly retains its prior character and role in the economy. This stability is argued to result from institutional complementarities with other subsystems – primarily, the structure of the public pension system – that inhibit a deeper transformation of the financial system.

The second, historical-political approach, eschews equilibrium analysis and conceives of institutions (and ‘equilibria’) as continuously evolving in non-trivial ways. This approach sees institutions as more or less constantly changing; in many instances smaller or gradual changes add up over time to major institutional transformation (e.g. Streeck and Thelen 2005; Crouch 2005a; Morgan 2005; Pierson 2004). There are a number of mechanisms through which gradual change can lead to major transformation. One central avenue is the gap that arises between the behavior prescribed by rules (i.e. institutions) and actual behavior under that rule. Actors exploit this gap by acting in self-interested ways that typically lead to a reinterpretation or modification of the rule. Sometimes the reaction to actor deviation from the rule is to strengthen or restore the original rule; sometimes the reaction moves the institution in a new direction (Streeck and Thelen 2005).¹¹

In this approach complementarities are also likely to matter a lot in shaping institutional change since actors’ behavior is motivated by a desire to increase their own gains, but not in ways easily measured or usable for predicting the direction of change. First, if the exact meaning of a rule is always subject to some interpretation or manipulation, the complementarity(-ies) that derive from that institution are also somewhat ambiguous. In other words, the effects of institutions are often either ambiguous or not what was originally anticipated at their inception. Thus actors may ignore complementarities

because they do not believe they can be reliably assessed or they are frequently shifting at unanticipated moments. Second, this approach tends to view complementarities as changing through an evolutionary, trial and error process (e.g. Crouch 2005b) rather than by a one-off moment of intentional design, as is typically assumed in the equilibrium-functionalist approach. Nor does this perspective assume that non-complementary institutions are likely to be weeded out of the environment by competitive selection. Thus complementarities among specific institutions are viewed as historically constituted and variable (i.e. context dependent) and do not have universal characteristics of applicability (see Morgan 2005). Institutions, in this view, do not simply reflect an economic logic or functionality but also serve other social purposes and embody relations of power and authority as well. Change in such institutions is thus guided also by forces other than efficiency gains (or preventing efficiency losses). Hence even institutions that are strongly complementary in a functional sense may change as a result of a shift in power among actors or social norms, not declining functionality. Efforts by actors to pursue their own optimal situation in response to environmental change may also undermine complementarities for other actors.

These two perspectives also lead to different views on how to measure complementarities and, more importantly, how important such efforts are for understanding change. Scholars within the equilibrium-functionalist perspective are more likely to focus on quantifiable complementarities and performance criteria such as innovation, profits, growth, etc. Quantitative assessments have the value of revealing the costs (and potential benefits) of institutional change. Knowing these costs, in turn, can inform predictions about the likelihood of change based on the difference between expected gains from change versus the switching costs (which are a function of complementarities, among other things). While there are clear benefits to such an exercise, the limitations are also clear. First, even where complementarities can be readily inferred from quantitative analysis, as one attempts to measure complementarity among more than two institutions it becomes technically very complex (Boyer 2005). Second, a simple toting up and comparison of relative costs and gains from institutional change is unlikely by itself to yield reliable predictions of change. Even within the assumptions of this perspective, actors' assessment of all costs and benefits is unlikely to be captured by any model. Third, a given set of institutions may generate varying levels of complementarity for different sets of actors – measuring the complementarity for one set may well be misleading then.

To this list the historical-political perspective argues the fact that institutions not only have functional performance effects (complementarities) but also social and political effects and these too factor into an analysis of change, yet are often harder to measure quantitatively. Social effects, when translated into measurable performance criteria that would assess the value of the complementarity they generate, might include 'normative coherence,' appropriateness, or trust. Political effects or complementarities could be defined on narrow measures like votes, but this is limited since for political actors complementarity is more likely to be

measured in harder to measure terms such as power effects, policy outcomes, or policy efficacy. These latter criteria are often not easily quantified. For example, in Germany the institution of worker co-determination on company boards appears to be complementary – from the union's perspective – with the newer institutions of corporate financial transparency because this generates more information (power) for unions to use in negotiating with management and in the general political arena (see Höpner 2005): yet the value of this complementarity is not easily quantified.

From the historical-political perspective, the 'snapshot' approach of the equilibrium perspective misses the point – it assumes the complementarities are static for a given set of institutions – but if institutions are constantly evolving in non-trivial ways, so too are the complementarities. This suggests that 'measuring' complementarity is likely to be possible (only) post hoc, and it cannot be assumed that what was measured at time A continues at time B, even when the institutions in question appear stable. Complementarity more often resides not in the institutions themselves but in how people use them – thus formal institutional stability can mask declining (or rising) complementarity from the perspective of different actors. A further implication of this perspective is that complementarities – while real and significant – are also less useful in understanding institutional change because politics (power), uncertainty, myopia, etc., play a big role in change and these are more unpredictable.

Beyond these methodological and ontological issues, there are other troubling questions such as how do we know when it is institutional complementarity and not just the normal role that institutions play in shaping actor behavior through the incentives they create? Not every institution is complementary to another just because it affects the behavior of actors in predictable ways. Institutional complementarity requires enhanced performance for someone as a result, such that changing one institution harms the other, i.e. the actors who benefited from the *coexistence* of these institutions.

The upshot, in my view, is that we must remind ourselves that institutional complementarity is only one element that affects institutional stability and change. There are other sources of institutional stability and change that do not necessarily reflect complementarity or an effort to obtain or maintain complementarity. Moreover, clustering and coherence may be more common than true institutional complementarity. Why might this be the case? First, institutional complementarity is context dependent: two institutions may complement each other in one setting but not in another. As Boyer (2005) points out, deposit insurance and prudential banking regulation became complementary in Germany but when transferred to Japan did not have the same positive effect: thus in Germany these institutions appear to be complements, but in Japan only clustered. Second, we know that many political economies are evolving through a process of hybridization and attributing performance outcomes to specific institutions under such conditions is difficult, to say the least.¹² Related to this point is the idea that the level or strength of complementarity between two given institutions (or institutional domains) is a moving target

in the sense that actors can learn over time to exploit institutions over time, thus strengthening the complementarity without any formal institutional change. If this is possible, the converse condition is also theoretically possible (Streeck 2005).

CONCLUSION

In this paper I set out to extend the utility of the concept of complementarity by beginning to address approaches to measuring it. The first step was to demarcate the boundaries of the concept by elaborating related but distinct concepts of institutional linkages such as clustering, compatibility, and coherence. The paper then reviewed some recent efforts to measure complementarity and argued that the tool belt should contain a variety of approaches, including Boolean analysis, case study, and game theoretic approaches. The paper further proposed that analysis will benefit from measuring complementarities not just at the macro but also at the micro level of the economy – specific institutions, sectors, and actors.

Finally, the paper related the discussion of measuring complementarity to the issue of explaining institutional change. It was suggested that complementarity must factor into analyses of change, but moving forward requires one to first embed the concept into a general theory of institutions and institutional change. In this paper two alternative theoretical perspectives were presented, each finding a different role for complementarities that leads, in turn, to different hypotheses about the role of complementarity in change and which methods are best suited to measuring complementarity.

Regardless of which theoretical perspective one adopts, there are some common requirements to utilizing effectively the concept of complementarity. The first is that the existence of complementarities should be deduced based on general theoretic or game theoretic arguments: but then the existence and strength of complementarity between two institutions needs empirical verification before it can be used to explain change (or stability). Second, it must also be recognized that the same set of institutions may produce different complementarities for different actors. Change in these institutions is thus likely to reflect different aims of different actors and institutional change will be shaped by the political struggle to determine ‘whose complementarity’ gets sustained or created. Third, complementarities may erode gradually over a longer period of time through endogenous changes, thus institutions exhibiting high complementarity at one point in time may not do so at a later point, even without obvious large-scale institutional change. Finally, it must be theorized and investigated from the outset that complementarity is likely to be only one (and perhaps a secondary) consideration that drives institutional choices by actors. Nonetheless, complementarities are central to institutional analysis and further progress in measuring and conceptualizing complementarity will do much to help answer a variety of important questions currently faced in the comparative study of political economies.

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NOTES

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- 2 Crouch actually considers this the true definition of complementarity, but to avoid confusion I use the term supplementarity.
- 3 In this paper I focus on complementarities generated within national economies and ignore the role of international or transnational institutions.
- 4 Boyer (2005) provides an excellent assessment of alternative methods and their suitability for measuring complementarity and related concepts of institutional linkage.
- 5 Here I follow Aoki (2001) and Amable (2003) in taking the definition of an institution as an endogenously determined rule for social interaction.
- 6 Though it can also be important to assess intra-domain complementarity.
- 7 For other assessments of complementarity between these two domains see Höpner (2005) and Kenworthy (2006).
- 8 Campbell and Pedersen (2007) also provide an excellent example of actor-specific complementarities and supplementarity in Denmark.
- 9 Hierarchy here suggests that in capitalist economies one institutional domain – such as finance – imparts its particular institutional logic to other domains of the economy.
- 10 Though Greif and Laitin (2004) have recently attempted to develop a theory of endogenous change within an equilibrium framework (see also Aoki 2001).
- 11 It should be noted that Aoki (2001) represents an important effort to bridge these two theoretical perspectives.
- 12 Though Campbell and Pedersen (2007) make just such an effort.

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