



# Varieties of capitalism, innovation performance and the transformation of science into exported products: A panel analysis



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## ABSTRACT

This study addresses the outstanding question in comparative capitalism literature of whether Mixed Market Economies (MMEs) are always at a comparative disadvantage regarding innovation performance because of their assumed institutional incoherence (lack of institutional complementarities). Based on panel data for 26 OECD countries over 21 years, we compare MMEs with Liberal Market Economies (LMEs) and Coordinated Market Economies (CMEs) in relation to four types of innovation outcomes (publications, patents, exports and transformation of science). The comparative analysis is conducted at both an integrated and a dyadic level. The integrated level of analysis compares different groups of countries. This study shows that MMEs are at a disadvantage regarding publications, patents and exports. However, MMEs perform better than LMEs and CMEs in the transformation of national science into exported products from high R&D intensity sectors. At the dyadic level of analysis, individual MMEs are compared with a typical LME (USA) and a typical CME (Germany). This comparison shows that some MMEs perform better than the USA and Germany. The evidence reduces support for the assumption that MMEs are always at a comparative disadvantage due to institutional incoherence. The findings indicate that institutional incoherence does not in itself inhibit innovation performance in high R&D intensity sectors.

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## 1. Introduction

In their VoC (varieties of capitalism) argument, Hall and Soskice (2001) suggest that an MME (mixed market economy) has a comparative disadvantage in relation to both radical innovation and incremental innovation. Subsequently, evidence from multiple studies either support or oppose this argument. Most of these studies focus on the notion of national 'institutional coherence', or complementarities, in liberal market economies (LMEs) such as the USA and in coordinated market economies (CMEs) such as Germany. Hall and Soskice (2001) posit that there is national institutional coherence in LMEs and CMEs, which offers them comparative advantages in radical and incremental innovation, respectively. On the other hand, MMEs lack national institutional coherence and thus perform poorly in both radical and incremental innovation. Institutional incoherence is the primary source of MMEs' comparative disadvantage. Subsequently, intellectual tension formed between those who see national institutional incoherence as a comparative disadvantage of the MME (Allen, 2013; Hall and Gingerich, 2009; Hall and Soskice, 2001; Schneider and Paunescu, 2012) and those who refute institutional coherence as a necessary or sufficient condition for comparative advantage of MMEs (Allen and Whitely, 2012; Campbell and Pedersen, 2007; Kenworthy, 2006; Lane and Wood, 2009; Nölke

and Vliegenthart, 2009; Taylor, 2004; Walker et al., 2014; Witt and Jackson, 2016). The core issue in this divide is that of institutional incoherence in the MME.

One side finds institutional coherence crucial for economic performance. The institutional coherence of the LME is seen as favourable for radical innovation, whereas the CME has the institutional coherence required to support incremental innovation. This is supported by empirical studies of national performance regarding patents (Akkermans et al., 2009; Hall and Gingerich, 2009), export performance (Allen et al., 2006; Schneider et al., 2010) and at other macro levels of analysis and outcome measures. At least partially, the original set of countries in the MME category such as France, Italy, Spain, Greece, Portugal and Turkey (Allen et al., 2006; Hall and Soskice, 2001), as well as a newly added set of MME countries such as Japan, Korea, Norway, Italy, Portugal, Czech Republic and Hungary (Schneider and Paunescu, 2012) fail to have better innovation performance because of their incoherent institutions.

The opposing argument suggests that institutional coherence is neither necessary nor sufficient. External changes and internal sector-level diversity can reduce the institutional coherence of an LME or CME, let alone an MME. Studies show that national economies achieve comparable innovation performance without conforming to either the LME or CME models (Campbell and Pedersen, 2007; Hancke et al., 2008; Nölke and Vliegenthart, 2009; Walker et al., 2014; Witt and Jackson,

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2016). Further evidence shows that some firms in LMEs are producing incremental innovation and some in CMEs are conducting radical innovation (Allen et al., 2006; p10; Mudambi, 2008). This evidence reduces support for the critical role of coherence. Sectoral differences deliver another blow to the disadvantages of institutional incoherence in relation to comparative advantage which may originate from sectoral positions of strength rather than institutional coherence (Allen and Whitley, 2012; Crouch et al., 2009; Witt and Jackson, 2016). Externally, internationalization exerts pressure on national economies to partially change and partially retain institutions. Efficient adaptations to external pressure create combinations of institutions that hardly exhibit coherence according to ideal type LMEs and CMEs.

These views argue against the role played by the institutional coherence of LMEs or CMEs to the exclusion of other factors (Lane and Wood, 2009). In short, institutional coherence or incoherence is neither a necessary nor a sufficient condition for comparative advantage (Kenworthy, 2006). The MME model with institutional incoherence can gain a comparative advantage through radical innovation in some sectors and national settings and through incremental innovation in other sectors and national settings (Campbell and Pedersen, 2007; Crouch et al., 2009; Hancke et al., 2008; Howell, 2003; Krammer, 2015; Li, 2015; Nölke and Vliegenthart, 2009; Taylor, 2004; Walker et al., 2014).

This debate has left several questions unanswered in the MME analysis. Firstly, the current literature defines coherence as external alignment to either the LME or the CME. This means that national institutional configurations are considered coherent if they reproduce the institutional complementarities that characterize either one or the other (ideal typical) model. However, institutions may be internal coherent without external alignment with LME or CME which may explain whether, and in which areas, the MME has a comparative advantage or disadvantage to the LME or CME in innovation performance.

Secondly, the literature on innovation performance of VoCs typically focus on patents or exports as proxies for national innovation performance while ignoring other aspects of performance such as scientific publications which are especially relevant in high R&D intensity sectors. In particular, there is no attempt in the literature to include the transformation of science (published and patented) into exported products as a measure of innovation performance.

Thirdly, the choice of categories for VoC comparisons is controversial. Most prior empirical studies focus on three fixed categories of capitalism (LME, CME and MME) based on data from 19 (Hall and Soskice, 2001) or 22 OECD economies (Akkermans et al., 2009; Allen et al., 2006). A later study based on data from 26 OECD economies identifies five VoC categories encompassing newly included countries as well as dynamic changes of the originally covered models (Schneider and Paunescu, 2012).

Further, most studies have ignored the role of military spending on technological spillover. Because the military influences national institutions and technological performance (Rustow, 2011), it makes sense to include military spending. For instance, the US military developed drones for internal purposes. However, the technology has spilled over into the commercial arena. Now, for instance, the media uses drones to capture political rallies, social gatherings, horse races and Olympic Games. In the recent industrial activity, some enterprises in the US and China are testing home deliveries from online vendors (e.g., Amazon in the USA and Alibaba in China) through drones. In the past, the development of computer technology and internet has roots in the US military's R&D projects. Thus, the spillover from military technology impacts on innovation performance. High innovation performance, in particular in relation to radical innovation, may partly originate from high military spending rather than institutional coherence or incoherence.

This study addresses the outstanding topical issues in various ways. We seek evidence of comparative advantage in MMEs as an effect of internal coherence rather than alignment with the institutional coherence

of either the LME or CME ideal types. The study not only compares MMEs with LMEs and CMEs but also include other VoC categories as identified in more recent studies. Further, it includes military spending as an additional variable explaining innovation performance.

Methodically, this study represents a more comprehensive approach than previous studies exploring whether the MME has a comparative disadvantage in national innovation performance across four measures: (i) publications, (ii) patents, (iii) exports, and (iv) transformation of national science into exports. The comparative analysis is conducted at both an integrated and a dyadic level. Most previous studies have been at the integrated level of analysis comparing different groups of countries. This study also includes a dyadic level of analysis with a comparison of individual MMEs the ideal typical LME (the USA) and CME (Germany).

Whereas most VoC studies focus on either LMEs or CMEs or the comparison of these VoCs, this study puts the spotlight on MMEs. The rationale for this focus is threefold. First, whereas some MMEs have adapted institutional features characteristic for LMEs or CMEs, some LMEs and CMEs have lost some ideal typical features and have in effect become MMEs. These dynamics of non-alignment with LMEs or CMEs suggest external incoherence through regional, sectoral and internationalised businesses. Second, evidence showing that the MME category contains multiple countries with institutions partially aligned with LMEs or CMEs and partially aligned with other members of the MME pool provides strong support for the emergence of new mixed categories. Third, differentiating between different MMEs provides opportunities for a better understanding of the actual institutional configurations that enhance innovation performance through internal coherence rather than external alignment with the two ideal types. These theoretical and practical issues rest on the concern for the large number of MME countries that are developing in their unique ways.

The literature on 'varieties of capitalism' rests on the USA as the benchmark of the LME and Germany as the benchmark of the CME. However, none of the existing studies specifically draws comparisons at the dyadic level within and between types of capitalism to assess comparative advantages of nations on various measures innovation performance. The current analysis provides a comparison within the MME, LME and CME as well as between the MME, LME, and CME. In doing so, it fills the void of intra-comparison and inter-comparison at the individual national levels.

## 2. Literature review and theoretical background

Hall and Soskice (2001) unambiguously argue that MMEs are at a disadvantage compared to LMEs or CMEs because they lack the institutional coherence of either LME or CME institutions. They suggest that LMEs have a comparative advantage in radical innovation performance (e.g., the USA) and that CMEs have a comparative advantage in incremental innovation (e.g., Germany) because of their national institutional coherence. In other words, the MME lacks the international institutional coherence found either in the USA or Germany. Therefore, the MME underperforms in both radical and incremental innovation performance (Hall and Soskice, 2001). In other words, the MME has aspects of the LME and CME but is not fully either type. Its hybrid nature makes it an inconsistent and inefficient form of capitalism and thus unable to attain a comparative advantage. Yet, is it always the case that the MME underperforms in any type of innovation performance, even when using multiple measures of innovation performance and levels of analysis? Before testing this view, we introduce central concepts at the outset.

### 2.1. Institutions and Innovation

Within the context of innovation, national institutions constitute and constrain strategic behaviour (Whitley and Morgan, 2012). This implies that national institutional mechanisms govern business activities

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