Labour Market Institutions and Structural Reforms: A Source for Business Cycle Synchronisation?*

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Abstract

We focus on the influence of institutional variables on business cycle synchronisation for 20 OECD countries from 1979 to 2003. More precisely, this paper derives measures for similarity of institutions and structural reforms, and investigates direct and delayed reform effects on synchronisation by applying robustness tests to a panel data framework with bilateral data. Our findings indicate a strong instantaneous relationship between both similarity of institutions as well as common structural reforms and business cycle correlation.

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1 Introduction

Business cycle synchronisation has been a frequently discussed topic in economics over the last decade, prevalently in the context of currency areas. Synchronised business cycles are likely to be an important prerequisite for the well-functioning of an optimal currency area (OCA). An example for this issue is given in the following. A common monetary policy, as it exists in a currency union, reduces the member countries' flexibility to shocks. If members of a currency area are in different business cycle positions, shocks probably require different economic reactions making it challenging to find an appropriate monetary policy adjustment for all members. Similar to this, candidate countries with less synchronised cycles could boost their chances of admittance to the currency union by bringing their idiosyncratic cycle into line with the currency area cycle. However, it is rather unclear which economic or political adjustments result in higher synchronisation, and which design the adjustments should exhibit. Therefore, a better understanding of the determinants of business cycle synchronisation and their exact functioning has become a main goal for politicians of both members of the European Monetary Union and aspirants for a membership since its advent in 1999.

Starting with Frankel and Rose (1998), who firstly examined the relation between trade intensity and business cycle synchronisation, there has been a growing literature on the determinants of business cycle convergence over the last decade. Factors like bilateral trade intensity, explained in more detail by e.g. Frankel and Rose (1998), and Gruben et al. (2002), or the degree of specialisation as pointed out by e.g. Imbs (2004), and García Herrero and Ruiz (2008) are quite evident transmission channels and have been detected as significant determinants in various studies for different specifications and frameworks. Similarity in fiscal policy, although not analysed as comprehensively as trade and specialisation, appears to be important for a stronger co-movement of output gaps. Some more explanation on this relation can be found in, for example, Inklaar et al. (2005) or Darvas et al. (2005).

Similarity of labour market institutions has recently gained importance in empirical analyses, mainly due to the availability of better data. Although studies on this topic predominantly deal with the impact of labour market structures on employment or economic growth, institutional settings are also likely to play an important role for the degree of business cycle synchronisation.

Our study extends the existing literature in several ways. We use an augmented set of structural indicators of institutional arrangements and implement a measure for the similarity of structural reforms concerning these institutions. Thus, both the impacts of institutional conditions and reforms are examined. Since reforms will need some time to materialise, we also include lagged values of the reform measures. There are strong theoretical implications about the impact of similar labour market structures on synchronisation. Nevertheless, it is unclear which institutional factors indeed affect the co-movement

of business cycles. Thus, we analyse empirically whether the theoretical assumptions can be confirmed, and which institutions matter. In order to receive reliable results, two approaches to test robustness are applied. In doing so, we examine the robustness of the effect of a variable by repeatedly estimating its coefficient with a changing information set.

The study is organised as follows. Section 2 presents theoretical considerations and empirical evidence on the determinants of business cycle synchronisation, while section 3 gives a short overview of the dataset. Section 4 explains the underlying empirical methodology including the structures of the robustness tests. The estimation results are presented in section 5, while section 6 summarises the findings and concludes.

2 Theory and Empirical Evidence

From a theoretical point of view, business cycles are the consequence of common and idiosyncratic shocks hitting a country. Business cycle synchronisation for any set of countries is mainly driven by factors which influence a country's shock adoption and propagation mechanisms, thus determining the resilience to macroeconomic shocks. Typically, variables like trade intensity, the similarity of sectoral structures, fiscal or monetary policy are assumed to influence the synchronisation of business cycles since these factors likely affect either the adoption or the propagation of shocks. While the mentioned factors have been extensively analysed in empirical studies, the role of labour market institutions is still unclear. In this chapter, we confine attention to the theoretical arguments why labour market institutions may influence business cycle synchronisation, and report earlier empirical findings on this topic. Furthermore, theoretical and empirical aspects concerning variables which have already been identified as determinants of business cycle synchronisation are presented. These variables are essential for our empirical analysis, since we include them as control variables.

2.1 Labour Market Institutions

Labour market institutions can affect the business cycle in various ways. Factors like the workers' bargaining power, employment protection legislation or the unemployment compensation determine how shocks influence a country's economic output. Blanchard and Giavazzi (2003) show that institutions which provide workers with a high bargaining power are responsible for an inflexible labour market since wage adjustments are more difficult to implement. Thus, the effects of shocks which, for example, increase a firm's production costs cannot be appropriately compensated via wage adjustments. This inflexibility could give rise to price increases and a fall in aggregate demand. Besides, institutions may have an impact on output fluctuations through their effect on the matching process. A high degree of employment protection lowers a firm's flexibility to respond to changes in ag-

gregate demand. Ljungqvist (2001) argues that unproductive workers (who would be laid off without employment protection) remain in a firm. Particularly during an economic downturn, the pressure of high firing costs forces firms to forego workforce adjustments as a reaction to, for example, a capacity under-utilisation. The additional wage payments to unproductive workers reduce the firms' room to maneuver and result in lower investments and higher prices. Moreover, following the argumentation of Boeri and van Ours (2008), less workers are hired in an economic upswing since firms include potential firing costs in their hiring decision, leading to an inefficient and unproductive allocation of labour. The amount of unemployment compensation may also affect the business cycle. Nickell and Layard (1999) show that a high spending on unemployment compensation reduces the job search intensity of the unemployed and, hence, labour supply. In this case, firms may not find enough productive workers during an upswing or after a positive economic shock. Nevertheless, a certain amount of unemployment compensation payment increases the probability that an unemployed finds a productive job, as pointed out by Arpaia and Mourre (2005). Without this transfer payment the unemployed would accept the first job offer which may be an unproductive match. However, this neglects the worker's opportunity to search on-the-job. Hence, the negative effect of a low unemployment compensation on the worker productivity is difficult to quantify. Overall, we do not claim that this overview is complete since further connections between labour market institutions and the business cycle are conceivable. Nevertheless, it delivers essential insights into the importance of institutions as a factor for the evolution of business cycles.

These considerations have the following implications for business cycle synchronisation: If countries have different labour market institutions, a common shock will lead to distinct economic consequences, resulting in diverging business cycles. In the same vein, the shock propagation mechanisms of two economies will be similar if they have comparable institutional arrangements. Nevertheless, common labour market structures may also lead to diverging cycles caused by asymmetric shocks, especially in the presence of highly inflexible labour market structures. High regulations concerning, for example, employment protection may impede appropriate industry-specific or country-wide reactions to a shock. Asymmetric shocks or different industry structures in the presence of common shocks may then result in different output fluctuations. Furthermore, institutional reforms are aimed to raise the economic flexibility and thereby a country's resilience to idiosyncratic or asymmetric shocks. In a monetary union this could compensate the inflexibility of the individual economies caused by e.g. a common monetary policy through a strengthened idiosyncratic shock absorption mechanism. Generally, we expect that similar reforms lead to higher synchronisation. However, this can only be true, if both countries' reforms are competition-enhancing, thus raising the countries' ability to cushion shocks. In contrast, regulative reforms should decrease the countries' resilience to idiosyncratic or asymmetric shocks, consequently lowering the degree of synchronisation.

Theoretically, the effects of similar labour market structures and reforms depend on whether idiosyncratic or common shocks prevail, as well as whether the reforms which are carried out are regulative or competition-promoting. Empirical results on this connection are scarcely available since only few studies concentrate on analysing the impact of institutional arrangements in the labour market on business cycle synchronisation, while reforms have not been analysed in this context up until now. Böwer and Guillemineau (2006) use employment protection legislation and union density as proxies for labour market flexibility and apply an extreme-bounds analysis in a cross-section framework. Similar to this, Artis and Claeys (2007) build their study upon a panel data set with employment protection legislation, union density, benefit replacement ratio and the tax wedge as indicators for labour market flexibility. None of the studies find a robust and significant effect of labour market structures on business cycle co-movement. Both studies use the absolute differences of the indicator values to account for differences in the institutional structures of two countries, but they do not consider institutional reforms. Furthermore, we take advantage of a larger set of institutional indicators and use a more systematic empirical approach to explain synchronisation.

While the role of labour market institutions for the degree of synchronisation is still an open question, there is an extensive literature which has dealt with the identification of the determinants of synchronisation. The factors which we describe in the following are taken as control variables for our empirical analysis.

2.2 Control Variables

Basically, trade is assumed to be the main transmission channel for business cycles and a key factor for higher co-movement. If, for example, the trade intensity between two countries is high, an idiosyncratic shock affecting the first country likely spills over to the trading partner, thus, influencing the countries' business cycles in a similar way. This happens, if the trade intensity is mainly driven by intra-industry trade. However, theory predicts that higher trade intensity also leads to an increased industrial specialisation, resulting in a larger fraction of inter-industry trade. Then, industry-specific shocks will not affect both countries in the same way, resulting in diverging business cycles. Obviously, the theoretical effects of trade intensity on synchronisation are ambiguous. In contrast to that, empirical studies find a positive relationship between a high trade intensity and similar business cycles. According to Frankel and Rose (1998), the overall effect of trade on business cycle synchonisation is strong. These findings are supported by subsequent studies of Gruben et al. (2002), Calderón et al. (2002) and Imbs (2004). Compared to the results of Frankel and Rose (1998), however, their conclusions point to somewhat lower effects of trade, but still support the view that trade intensity has a positive impact on business cycle synchronisation. The studies of Baxter and Kouparitsas (2005) and Böwer and Guillemineau (2006) find that trade is robustly connected with business cycle

synchronisation and thus confirm the view of Frankel and Rose (1998).
Fiscal policy may contribute to business cycle correlations as well. Fiscal divergence can be the result of the reaction to idiosyncratic shocks which helps to keep together the business cycles. In this case, fiscal policy works as an instrument of flexibility to increase an economy's resilience against idiosyncratic or asymmetric shocks. But fiscal convergence may also foster synchronisation if common shocks are absorbed in a similar way by countries with a common fiscal policy. Altough the fiscal policy mechanism is theoretically conflicting, Darvas et al. (2005) provide empirical support of a positive impact of complementary fiscal policies on synchronisation in a panel of OECD countries. In a similar vein, Akin (2007) finds that similarity in bilateral fiscal policies fosters output synchronisation. Overall, the recent literature suggests that similarity in fiscal policies has a positive effect on business cycle synchronisation.
Similar to trade intensity, the theoretical considerations do not help to get a clear picture about the role of a comparable sectoral structure. If two countries exhibit a similar sectoral structure, shocks will affect both economies in a similar manner, while highly specialised industries in the presence of common shocks cause business cycle divergence. If idiosyncratic shocks prevail, the effect of a common sectoral structure on synchronisation highly depends on whether these shocks spill over. Shocks which finally have an impact on both countries result in higher synchronisation, while little shock spill-overs lead to diverging business cycles. Empirically, convergence of business cycles is more likely to arise between countries that have similar production structures. Otto et al. (2001) find that similar industry structures are positively correlated with output co-movement. However, the results are not statistically significant. Likewise, both Baxter and Kouparitsas (2005) and Böwer and Guillemineau (2006) conclude that structural similarity goes in line with convergence, although the outcome is weak. Furthermore, Imbs (2004) and García Herrero and Ruiz (2008) find clear evidence that similar production structures tend to promote the synchronisation of cycles.
Even the effects of a common monetary policy, often displayed by a currency union, on synchronisation are not clear-cut. On the one hand, it contributes to more similar output fluctuations by bringing into line the monetary policy reactions of different countries facing the same shock. Furthermore, a common monetary policy promotes the trade intensity inside a currency area by reducing the barriers to trade. However, it is unclear whether inter-industry or intra-industry trade will gain importance. As already mentioned, the trade characteristic determines the impact on synchronisation. Additionally, countries lose a mean of flexibility to react to idiosyncratic or asymmetric shocks by submitting to a common monetary policy, thus, the effect on synchronisation cannot easily predicted. Empirical studies on this relationship deliver contrary results. While Baxter and Kouparitsas (2005) as well as Clark and van Wincoop (2001) do not consider a currency union as relevant for the determination of business cycle synchronisation, Frankel and Rose (2002)

report a significantly positive effect of a common currency for the similarity of business cycles. They conclude that a currency union promotes the trade intensity inside of a currency area without observing a trade intensity decline with nonmembers.

3 Data

The analysis of synchronisation between countries has to be based on the construction of country pairs in order to capture differences between countries. We use an unbalanced panel that covers 20 OECD countries, and makes a total of 190 country pairs. Such a panel estimation requires a common time frame that conforms to the smallest available period. Furthermore, developing a measure for business cycle synchronisation calls for the construction of periods of more than one year. Following the existing literature, periods of five years length are specified. Therefore, we define that our time frame ranges from 1979 to 2003, since this is the least common period in terms of data availability. The underlying data structure consists of five periods of five years each starting in 1979, such that the first period covers the years from 1979 to 1983, while the second period goes from 1984 to 1988, and so on.

The following variables are included in our empirical analysis. The endogenous variable is represented by the output gap correlations over 5-year periods. Bilateral measures for institutional similarity and the similarity of institutional reforms are the variables of interest. Overall, we apply 19 indicators which cover 5 different policy fields of the labour market. More specifically, indicators for employment protection (EP), union density (UD), bargaining coordination and centralisation (BCO, BCE), replacement rates (RR) as well as labour taxes (TX) are included. In the following, the measures for institutional similarity will be denoted as 'distance', while the bilateral reform indicators are called 'direction'. Measures for trade intensity, similarity of fiscal policy and of sectoral structure as well as a currency area dummy to capture the effect of a common monetary policy serve as control variables. For all explaining variables, we calculate the 5-year averages of the bilateral measures to get variables which fit to the panel structure. All further technical details and explanations concerning data sources and the construction of variables can be found in Appendix 1.

4 Econometric Methodology

This section describes the econometric methodology to examine the impact of labour market institutions and structural reforms on business cycle convergence and synchronisation. The basic equation for our empirical analysis is the following panel regression model:

$$Y = \alpha + X\beta + Z_{dis}\delta_{dis} + Z_{dir}\delta_{dir} + \lambda + u. \quad (1)$$

We specify a fixed effects model to control for time independent effects of each country. Y represents the contemporaneous correlations of a country-pair's business cycles for each time period taken from the pool of 20 OECD countries. The business cycles are extracted by the Hodrick-Prescott (HP) filter to generate the correlations over the initially defined 5-year periods. X contains the variables *trade intensity*, *sectoral structures*, *fiscal policy* and *currency area* as defined in Appendix 1. These control variables are included in each regression. Z_{dis} and Z_{dir} are both sets of institutional variables, the former contains the 19 indicator differentials, the latter represents the 19 direction indicators which have potentially significant explanatory power for business cycle convergence. The 38 indicators for institutional similarity and common structural reforms build the indicator pool. Each indicator is taken as the variable of interest while combinations of the remaining indicators represent the information set. It is important to mention that the corresponding distance and direction terms of an indicator are always estimated together. This is necessary due to the fact that the mutual influence between a distance and direction measure is not clear-cut, and leaving out one of them could lead to less reliable coefficients. Another important restriction of the model is the ex ante exclusion of some indicator combinations. Indicators which belong to the same institutional area are not jointly estimated. We proceed this way in order to avoid a multicollinearity problem. Finally, α and λ capture cross-section and period specific effects. The equations are estimated by using the standard fixed-effects estimator.[1]

4.1 Extreme-Bounds Analysis

To identify the key reform factors on business cycle co-movement within the 20 OECD countries, we perform an extreme-bounds analysis. According to Leamer (1985), an extreme-bounds analysis is an organised way of a sensitivity analysis, enabling the examination whether the inferences about the variable of interest remain basically identical when changing its information set, thus, not depending on the inclusion of varying institutional indicators. Applied to equation (1), Leamer's approach proceeds as follows:

$$Y = \alpha + X\beta + z_{dis}\gamma_{dis} + z_{dir}\gamma_{dir} + Z_{dis}\delta_{dis} + Z_{dir}\delta_{dir} + \lambda + u \quad (2)$$

z_{dir} and z_{dis} denote the variables of interest, the institutional variables, which are under examination of their robustness. The information set Z consists of all possible combina-

[1] It has to be mentioned that the lack of valid instruments prevent us from taking into account the possible endogeneity problem of our model by applying an instrumental variable estimation.

tions of up to three indicators (each with its corresponding distance and direction term) picked from the complete indicator pool.[2] The field of analysing business cycle synchronisation within the framework of institutions and structural reforms is comparatively new. Hence, there is considerable uncertainty about what variables of Z belong to the 'true' regression model. Since labour markets are influenced by several institutional factors, and theory gives no explicit guidance about which institutional aspects affect business cycle synchronisation we have to rely on statistical robustness tests to find out which are the determining institutional variables of synchronisation. Changing the conditioning variables, for example, can result in conflicting effects concerning the impact of labour market institutions and reforms on the correlation of business cycle between countries. On account of this, we have to run OLS regressions in form of equation (2) for all possible combinations of one to three variables of Z.[3] Therefore, for each model two coefficients $\hat{\gamma}_{dis/dir}$ and their standard deviation $\hat{\sigma}_{dis/dir}$ are generated. A variable is considered as robust when the coefficient remains significant and the upper and lower extreme bounds have the same sign, where the upper extreme bound is defined as:

$$UEB = \hat{\gamma}^{max} + 2\hat{\sigma}(\hat{\gamma}^{max}) \tag{3}$$

and the lower extreme bound:

$$LEB = \hat{\gamma}^{min} - 2\hat{\sigma}(\hat{\gamma}^{min}) \tag{4}$$

If the tested variable does not pass this criterion, it is regarded as 'fragile', implying that no reliable relationship could be identified and changes in the information set have a considerable impact on this variable. Consequently, it is not regarded as an essential determinant in the basic model.

4.2 Alternative Approaches

The literature often characterises the criterion of Leamer as too strong and restrictive, with the consequence that often almost no variable can be classified as robust. Sala-i-Martin (1996) mentions that the Leamer suffers from the assumption that one regression for which the coefficient changes its sign is enough to reject the robustness of a variable. This might be a serious problem in particularly for large sets of variables of interest.

[2] In this case, Z_{dis} and Z_{dir} form the pool of all institutional indicators, except of the variable of interest z.

[3] This is consistent with the existing literature, for example Levine and Renelt (1992), Sala-i-Martin (1996) and Böwer and Guillemineau (2006), who carry out the test of robustness with combinations of three. To ensure comparability, we also present our results for up to three additional structural reform distance and direction pairs.

Based on this critique, there are several approaches described that provide alternative ways to relax the criterion. Sala-i-Martin (1996) suggests alternative techniques to move away from this extreme test. The basic idea is to take account of the whole distribution of a coefficient. In order to determine the robustness of the variable, the fraction of the density function lying on the right (left) side of zero is crucial. If more than 95% of the density for the estimated parameters lies to the right (left) side of zero, then the variable is considered to be robust. Sala-i-Martin denotes the larger section as CDF(0), whereas CDF is the Cumulative Distribution Function. Since zero divides the density into two, it is not of importance, whether the larger share of coefficients is above or below zero. Hence, per construction, the interval of the CDF is [0.5;1]. Due to the fact that the distribution of the indicator coefficients might not follow a normal distribution, Sala-i-Martin constructs two different cases. The first case is appropriate, when the mass of estimated coefficients follow a normal distribution, whereas the second case should be used, when this assumption fails. Furthermore, it is distinguished between a weighted and an unweighted approach. Regressions, which are more likely to be close to the true model are given more weight. The weighting scheme is based on the likelihoods of each regression to compute the weighted average of the estimated coefficients as well as their variances. However, this methods should not be applied when the goodness of fit might not be a good measure in order to identify the 'true' model (for a detailed description of the methods see Sala-i-Martin 1996 and 1997).

5 Results

5.1 Institutions and Structural Reforms

The first part of this section deals with the contemporaneous influences of institutional similarity and structural reforms on business cycle convergence. The results of the robustness tests are displayed in Table 1. The outcomes of three different robustness tests are presented. Following the considerations of Section 4, we report robust variables using Leamer's as well as Sala-i-Martin's approach. A variable is denoted as robust, if it passes the particular test. According to Böwer and Guillemineau (2006), we use a special form of quasi-robustness for Leamer's test. A variable is quasi-robust if the upper and lower extreme bounds have distinct signs, but more than 95% of the variable's estimated coefficients are significant. The column 'variable' displays the robust indicators, distance measures are above and direction measures below the line. The further columns refer to Leamer's and to Sala-i-Martin's methods, the latter split up into assuming first a normal (n), and secondly a non-normal (nn) distribution, both calculated using weights (w).
We find a total of eight distance and four direction measures which pass at least one of the robustness tests explained in section 4. Some of these variables are indicators for the same instance, such that the relevant indicator groups are bargaining coordination, bargaining

Table 1: Tests of Robustness, contemporaneous effects

	Variable	Leamer	Sala-i-Martin (n+w)	Sala-i-Martin (nn+w)
Institutional Similarity (distance)	BCO1	quasi-robust	robust	robust
	BCO2	fragile	robust	robust
	BCO3	robust	robust	robust
	BCO4	robust	robust	robust
	BCE3	fragile	robust	robust
	BCE4	fragile	robust	robust
	TX3	fragile	robust	robust
	TXW	fragile	robust	robust
Institutional Change (direction)	BCO3	fragile	robust	robust
	BCO4	fragile	robust	robust
	RR2	quasi-robust	robust	robust
	TX2	fragile	robust	robust

Note: Column 3 contains results belonging to Extreme-Bounds Analysis. Columns 4-5 display results belonging to Sala-i-Martin's approach, whereas column 4 shows the normal, weighted case and column 5 the non-normal, weighted case.

centralisation, the employment tax rate and the tax wedge for institutional similarity, and bargaining coordination, replacement rates and the direct tax rate for structural reforms. The complete results for all included indicators can be found in Table 3 in Appendix 2. Note, that only four variables are robust in terms of Leamer's test. The considerably different results between Leamer's and Sala-i-Martin's test can have two sources: the first test might be too restrictive, or the restriction of the second test is insufficient. As explained in section 4.2, we basically argue in favour of Sala-i-Martin's test. However, we also report Leamer's results, since there is no formal evaluation which test is more reasonable. Leamer's test in this sense allows a further assessment of the reliability of the results. If a variable does not pass both test procedures, we have to be even more careful in making final statements about its importance. Sala-i-Martin (1997) proposes the likelihood weighting in order to add weight to regressions which are more likely to be close to the true model. This weighting is rather doubtful if used in an unbalanced panel framework as we do. A different amount of observations probably influences the likelihood of a regression such that indicators with more observations raise the goodness of a regression. Therefore, we also estimated the unweighted CDF's for both the normal and non-normal distributions. The correlations between the different CDF values are also reported in Table 3, Appendix 2. The high correlations between the normal and the non-normal as well as between the weighted and unweighted CDF's indicates, that both modifications do not change the results substantially. The above described results draw upon the assumption that reforms have a somewhat immediate effect on business cycle synchronisation. Furthermore, we conduct an extreme-bounds analysis with lagged direction indicators in order to take account of the fact that reforms likely need some time to

materialise. Therefore, we slightly change equation (2) by replacing all contemporaneous direction terms by the corresponding lagged direction terms. Similar to Table 1, Table 2 presents lagged structural reform indicators which pass at least one robustness test.

Table 2: Tests of Robustness, delayed effects

	Variable	Leamer	Sala-i-Martin (n+w)	Sala-i-Martin (nn+w)
Institutional Change (direction)	BCO1	fragile	robust	robust
	BCO2	fragile	robust	fragile
	BCO3	fragile	robust	robust
	BCO4	fragile	robust	robust
	BCE1	fragile	robust	robust
	BCE3	fragile	robust	fragile
	BCE4	fragile	robust	fragile
	RR3	fragile	robust	robust
	TX1	fragile	robust	robust
	TXW	fragile	robust	robust

Note: Column 3 contains results belonging to Extreme-Bounds Analysis. Columns 4-5 display results belonging to Sala-i-Martin's approach, whereas column 4 shows the normal, weighted case and column 5 the non-normal, weighted case.

We do not report any distance indicators since including lagged variables lead to the omission of the first time period. Therefore, the robustness tests of the delayed model is less reliable than the results of the contemporaneous model. Nevertheless, it should be mentioned that almost all distance indicators show quite similar results (see Tables 3 and 4). The complete results of the delayed effects can be found in Table 4 in Appendix 2. The findings displayed in Table 2 regard a total of ten delayed direction indicators as robustly affecting business cycle synchronisation. More precisely, bargaining coordination, bargaining centralisation, replacement rates, the employment tax rate and the tax wedge are identified as robust determinants. However, it has to be pointed out, that a measure of bargaining coordination (*BCO2*) and two of bargaining centralisation (*BCE3*, *BCE4*) are sensitive to the choice of distribution scheme concerning Sala-i-Martin's approach, since it changes from robust to fragile (and the CDF values drop clearly) if the assumption of an underlying normal distribution is removed. It neither passes Leamer's robustness test what indicates its fragility.

5.2 Control Variables

Although the control variables trade intensity, sectoral structure and fiscal policy are not a central element of our study, we report the results in order to find out whether the level and direction of influence are in line with previous studies. Trade intensity has been identified as a key determinant in various contributions. We find a positive linkage between higher trade intensity and business cycle convergence. However, the effect is

insignificant in various specifications. This confirms the findings of Gruben et. al (2002) or Calderón et. al (2002) who found a positive but not always significant effect of trade. Similar to this, the influence of a similar fiscal policy in our model is also positive. In other words, two countries with a similar fiscal policy are likely to have more synchronised business cycles, even if the direction of causality is not necessarily unambiguous. This result is in line with Darvas et al. (2005) and Akin (2007), who found a positive and significant impact of fiscal convergence on synchronisation. However, the significance of the fiscal policy coefficient in our model depends largely on the chosen specification. Hence, our results concerning fiscal policy are still convincing, but less clear-cut than the findings of Darvas et al. (2005) and Akin (2007). In contrast to that, the role of a common sectoral structure is still unclear. The influence seems to be positive, but the corresponding coefficient is insignificant in nearly all estimated regressions. Hence the findings of earlier studies like Imbs (2004) or García Herrero and Ruiz (2008), indicating a positive influence of similar sectoral structures, cannot unambiguously be corroborated. Finally, the monetary policy dummy is insignificant in all specifications. However, one has to keep in mind that an immediate effect of a common monetary policy on business cycle synchronisation is an assumption which may not hold in reality. Thus, the role of currency areas on synchronisation cannot be clarified without taking advantage of a longer time frame.

5.3 Sensitivity Analysis

Up to now, the whole empirical analysis was based on business cycles extracted by using the HP-filter. Since different filtering methods can lead to distinct empirical results, we want to check whether applying the Baxter-King (BK) band pass filter changes our findings. Therefore, we repeat our analysis with correlations calculated on the basis of BK-filtered business cycles. The results do not change substantially indicating the insensitivity of our findings to the particular filtering method. The same indicators, both for distance and direction, are identified as robust and have nearly the same CDF values. The upper and lower extreme-bounds show a higher variation but the main conclusions remain unchanged. This is consistent with other studies like e.g. Darvas et al. (2005) who also tested different business cycle extraction methods with only slightly changing results. Furthermore, there is some uncertainty about possible heteroskedasticity. Thus, we apply White's heteroskedasticity correction in our regressions, which controls for both cross-section as well as period specific heteroskedasticity. Taking this into account does not change the results significantly. Serial correlation is rather unlikely to occur due to our data transformation to 5-year averages and to the small amount of available time periods. Finally, we extend our model to combinations of up to four institutional variables additional to the indicator of interest in equation (2). Thus, a total of 14 explaining variables are included in each regressions. Trade intensity, Sectoral structure, fiscal and

monetary policy are fixed, while combinations of four (and in Leamer's case up to four) indicators are picked from the pool of institutional variables. Yet this extension does not cause any shift in the outcomes.
Further sensitivity tests depend on the outcomes of the robustness tests. Both the coefficient for sectoral structure and the monetary policy dummy are insignificant in all of the regressions. Thus, we exclude them from the pool of control variables and repeat the robustness analyses. This modification causes no qualitative revision of the outcomes, neither for the distance nor the direction terms. The exclusion of the sectoral structure variable permits the extension of the available time frame for the panel estimations. Thus, we build 5-year periods for an alternative time frame from 1970 to 2004. The same robustness tests for this modified setup induces some new results, compared to the basic outcomes. Four variables change from robust to fragile, while four other indicator terms now turn out to be robust. We also note some changes for the lagged direction indicators. Two measures lose importance, while two other variables become highly significant. The remaining results qualitatively hold for the longer time frame from 1970 to 2004.

6 Conclusions

In this paper, we seek to identify robust institutional variables influencing business cycle synchronisation. Our focus lies both on differences in institutional arrangements as well as in structural reforms. Therefore, we establish a bilateral measure for structural changes and, in addition to the differences of institutional arrangements, analyse its contemporaneous and its lagged effect on business cycle convergence. Our results show that institutional similarities concerning bargaining centralisation and coordination, the indirect tax rate as well as the tax wedge are important determinants of higher co-movement. Similar to that, common structural reforms in terms of bargaining coordination, replacement rates and the direct tax rate instantaneously reduce business cycle differences. Reforms of bargaining centralisation and coordination, replacement rates, the employment tax rate and the tax wedge have a delayed impact since these changes likely need some time to materialise. The findings indicate that institutional conditions and structural changes play an important role for the determination of business cycle synchronisation. Countries with common institutional settings are likely to react in the same way to a symmetric shock which in turn leads to similar business cycles. Analogous to this, common reforms also tend to increase business cycle convergence, probably through higher economic flexibility which increases a country's resilience to asymmetric shocks. Our results lead to the following considerations: Since high synchronisation of business cycles is regarded as an important prerequisite for an OCA, member countries as well as candidate countries should take into consideration that bringing their institutional settings into line and synchronise their reforms could facilitate a common monetary policy.

However, it has to be kept in mind that we made the assumption of institutions affecting synchronisation, and not vice-versa. This leads to potential endogeneity in our model because closer business cycles may affect the similarity of institutional arrangements and the reforms which countries carry out. We do not control for that as it is virtually impossible to find appropriate instruments for institutions. Additionally, it is rather doubtful why some measures of an institutional area like e.g. bargaining coordination are robust and some measures of the same institutional factor are not. As a matter of fact, they account for the same thing. This probably happens due to the difficult determination of comparable institutional indicators.

Furthermore, alternatively calculated periods somewhat change the results for some indicators. Therefore, it should be kept in mind that we only observe a qualitative relationship between structural indicators and business cycle synchronisation. Finally, the results applying Leamer's robustness test are less significant. This could be caused by the strong restrictions of the test. Moreover, the decision about robust and fragile are to a certain extent subjective. Thus, quantitative statements about the influence of particular indicators as well as the exact identification of significant sub-indicators go beyond the scope of this paper. Nevertheless, this study sheds light on the potential influence of labour market institutions on business cycle synchronisation and extends the existing literature by identifying additional determinants of business cycle convergence.

7 Appendix 1: Description of Data Sets

7.1 Institutional Indicators

The Nickell-Nunziata database (see Nickell and Nunziata (2001) as well as Nickell (2006)) delivers eight different groups of institutions for 20 OECD countries, where each group contains several indicators. Not all indicators show a comprehensive data coverage in terms of countries and periods. Therefore, we have to exclude some of them with insufficient data availability for our study. The indicator areas that we use in our analysis refer to employment protection, union density, bargaining coordination and centralisation, replacement rates and taxes. Additionally, indicators for which only limited data is available compared to other indicators of the same group will not be incorporated in the following estimations. The analysed group of institutional indicators consists of 19 different measures, each of them linked to one of the aforementioned five institutional areas. A detailed description of the complete database is given by Nickell and Nunziata (2001) and Nickell (2006), while the institutional indicators, which have been taken into consideration for our own study, are described in the following, sticking to the definitions given by Nickell (2006).

Table 3: Description of institutional variables

Variable	Description	Unit	Range
EP1	Employment protection legislation data from the OECD labour market statistics database using version 1 of the indicator: the strictness of employment protection legislation.	index	[0,2]
EP2	Employment protection legislation series taken from Allard (2005a). This series uses the OECD methodology.	index	[0,5]
UD1	Union density is Union membership/Employment and was calculated using administrative and survey data from the OECD labour market statistics database.	%	
UD2	This series takes UD1 and extends it by splicing in data from Visser (2006).	%	
BCO1	This is a five year period index of bargaining coordination taken from OECD (2004). It is increasing in the degree of coordination in the bargaining process on the employers' as well as the unions' side.	Index	[0,5]
BCO2	As BCO1 but interpolated taking the figure given in the table as the middle number of the five year period.	Index	[0,5]
BCO3	This is an index of bargaining coordination taken from Ochel (2000). Based on data reported in OECD (1994), (1997), Traxler and Kittel (2000), Wallerstein (1999), Windmuller et al. (1987) and Bamber and Lansbury (1998).	Index	[1,3]
BCO4	As BCO3 but interpolated.	Index	[1,3]

BCE1	This is an index of bargaining centralisation taken from OECD (2004) Table 3.5. It is increasing in the degree of centralisation.	Index	[0,5]
BCE2	As BCE1 but interpolated.	Index	[0,5]
BCE3	This is an index of bargaining centralisation taken from Ochel (2000).	Index	[1,3]
BCE4	As BCE3 but interpolated.	Index	[1,3]
RR1	Gross benefit replacement rates data are provided by OECD with one observation every two years for each country. In this case the data refer to the first year of unemployment benefits, averaged over three family situations and two earnings levels. The benefits are a percentage of average earnings before tax.	%	
RR2	These are original benefit replacement rates data published by the OECD. It is defined as the average across the first five years of unemployment for three family situations and two money levels taken from www.oecd.org/els/social/workincentives and interpolated.	%	
RR3	Alternative series describing unemployment benefits by Gayle Allard. The author develops a new indicator for unemployment benefits which combines the amount of the subsidy with their tax treatment, their duration and the conditions that must be in order to collect them. See Allard (2005b) for further details.	%	
TX1	The employment tax rate is ESS/(IE-ESS) with ESS equal to employers' social security contributions and IE equal to total compensation for employees. ESS is available from the OECD National Accounts detailed tables and IE from OECD Revenue Statistics.	%	
TX2	The direct tax rate is DT/HCR with DT equal to income tax plus employees' social security contributions and HCR equal to household current receipts. Figures for income tax and employees' social security contributions were taken from OECD Revenue Statistics. HCR was taken from OECD National Accounts directly for pre- 1990 and was calculated as the sum of compensation of employees, property income, social contributions and benefits and other current transfers for post- 1990.	%	
TX3	The indirect tax rate is (TX-SB)/CC with TX equal to indirect taxes, SB equal to subsidies and CC household final expenditures. All three were taken from OECD National Accounts.	%	
TXW	The Tax Wedge is equal to the sum of the employment tax rate, the direct tax rate and the indirect tax rate.	%	

7.2 Measuring Institutional Similarity and Institutional Change

Both a measure for institutional similarity as well as for institutional change are considered in order to analyse whether institutions – and changes therein – have an influence on business cycle synchronisation. This yields insights into the effects of both the institutional

status quo and the conduct of structural reforms. First of all, an appropriate bilateral measure for institutional similarity is required. We denote the indicators as P^k. The index k ranges from 1 to 19, thus numbering the different indicators. Our measures for institutional similarity are the absolute differences between countries in the levels of the particular indicators P^k, such that

$$Z^k_{dis,ijt} = -(|P^k_{it} - P^k_{jt}|), \tag{5}$$

with P^k_{it} defined as the level of the particular indicator P^k of country i at time t. In doing so we get 19 different bilateral indicators for institutional similarity between the countries, in the following denoted as distance. Higher (lower) values of the $Z^k_{dis,ijt}$ coefficient in the result tables display more (less) similarity between the countries i and j. To measure institutional change, the growth rates of each indicator P^k are calculated for each country. Then the absolute differences between countries in the growth rates of the particular indicators P^k represent the measure for the (dis)similarity of institutional change. This relationship can be seen in the following expression

$$Z^k_{dir,ijt} = -(|g^k_{P_{it}} - g^k_{P_{jt}}|), \tag{6}$$

where $g^k_{P_{it}}$ and $g^k_{P_{jt}}$ describe the growth rates of the particular indicator P^k of countries i and j at time t. The resulting term $Z^k_{dir,ijt}$ is a bilateral variable measuring the relation between an institutional change conducted in countries i and j. Overall, we can exploit a total of 19 bilateral reform indicators. Higher (smaller) values of the $Z^k_{dir,ijt}$ coefficients in the result tables are linked to a stronger (weaker) similarity between the countries i and j with respect to indicator P^k. Henceforth, this measure for institutional change will be called direction.

7.3 Business Cycle Synchronisation

Due to the fact that business cycles are not directly observable and measurable, an appropriate methodology to estimate them is required. On the basis of the observable real GDP series of the OECD for all 20 countries, the cycles can be calculated by filtering the GDP series. There are quite a few possibilities for measuring the business cycle. De Haan, Inklaar and Jong-a-Pin (2005) give a short insight into the differences between alternative filtering methods. They conclude that, 'studies that use standard filters such as the Hodrick-Prescott, Baxter-King and Cristiano-Fitzgerald filters are likely to yield similar results'. Azevedo (2002) analyses several filters and justifies the application of the HP filter in the context of extracting the business cycle. Thus, the commonly used HP filter with a λ of 100 is applied in order to obtain the output gap as a measure of the stage in

the business cycle. To take account of the existing uncertainty, a sensitivity analysis with the BK filter as an alternative filtering method is conducted to check for the reliability of the results. The cycle length of the filter is set at 3 to 8 years with a maximum lag length of 3 years. The cycle measured by using the BK filter is introduced as a substitute for the HP-filtered series, serving as a sensitivity test for the results obtained with the HP filter. The connection between the business cycles of two countries is made by calculating the corresponding Pearson correlations over 5-year periods. In the following, the control variables included in addition to the structural reform indicators will be described.

7.4 Trade Intensity

Trade is regarded as the major transmission channel for business cycles and a prime candidate variable for driving business cycle synchronisation. To account for the likely influence of trade in this context, we construct an indicator of bilateral trade intensity, following the approach of Frankel and Rose (1998), who defined a variable measuring the share of the two countries' bilateral trade flows in the total volume of their trade flows with all partner countries. More formally, the variable is calculated as

$$trade_{ijt} = \frac{X_{ijt} + M_{ijt}}{X_{it} + M_{it} + X_{jt} + M_{jt}}, \tag{7}$$

Here, X_{ijt} stands for the volume of exports from country i to country j during period t and M_{ijt} correspondingly stands for country i's imports of goods from country j. X_{it} and M_{it} denote the volume of country i's total exports and imports in year t, respectively. Annual data for bilateral and total trade volumes are taken from the IMF Direction of Trade Statistics database and are measured in US dollar at current prices.

7.5 Sectoral Structures

To measure differences in sectoral specialisation of the production structure of two countries the following variable is constructed

$$sec_{ijt} = \sum_{s=1}^{S} |VAS_{sit} - VAS_{sjt}|, \tag{8}$$

where sec_{ijt} is the sum of the absolute differences of two countries i's and j's value-added shares for each sector. These value-added shares VAS_{sit} measure each sector's relative importance in the production structure of an economy and are calculated as

$$VAS_{sit} = \frac{VA_{sit}}{\sum_{\tilde{s}=1}^{S} VA_{\tilde{s}it}}, \tag{9}$$

This measure is a modification of the measure implemented by Krugman (1991) who used sectoral employment shares rather than sector value-added shares. The data for sectoral value-added are taken from the Industry Database of the Groningen Growth and Development Centre (2006). This database provides annual data for 60 sectors covering all OECD countries and thus enables a very detailed and disaggregated analysis of the sectoral differences. The use of such data is an improvement on studies such as Imbs (2006) who used sectoral data of a higher degree of aggregation, or on studies using data not covering the whole economy. For two countries with exactly the same production structure, sec_{ijt} is equal to 0, while it takes a value of 2 for two countries with completely disparate sectoral structures. However, even in the large country sample there is no country pair with a value exceeding 0.93 and the average value of sec_{ijt} is 0.48. Considering that the sample comprises mostly industrial countries, this relatively low degree of sectoral difference is not surprising.

7.6 Fiscal Policy

Fiscal policy also seems to be a source for business cycle synchronisation. In our study, we rely on the primary government net lending, measured as a percentage of GDP and taken from the OECD database, to construct the bilateral fiscal policy variable. Taking the absolute differences between countries i and j, the net lending value delivers a measure for the similarity of the countries' fiscal policies. In doing so, we follow Darvas et al. (2005), who initially developed this approach to generate a bilateral measure for fiscal policy.

7.7 Currency Area

We construct a bilateral dummy variable as a measure for the similarity of monetary policy. This dummy takes the value 1 if two countries are members of the same currency area. Actually, the dummy captures the euro effect, since it takes the value 1 for countries of the euro area for the last measured period from 1999 to 2003, and 0 else.

8 Appendix 2: Result Tables

Table 4: Test of Robustness, contemporaneous effects, complete results

		Leamer			Sala-i-Martin			
	Variable	UEB	LEB	Sign	n+w	n+uw	nn+w	nn+uw
Employment Protection	EP1_dis	−0.6607	0.6460	0.00	0.6076	0.5969	0.6062	0.5954
	EP1_dir	−2.2197	3.0578	0.00	0.5589	0.6069	0.5257	0.5711
	EP2_dis	−0.2695	0.1481	2.02	0.8508	0.8362	0.8221	0.8053
	EP2_dir	−0.6811	0.4981	0.00	0.6692	0.6631	0.6647	0.6584
Union Density	UD1_dis	−0.0070	0.0150	4.37	0.8759	0.8834	0.8565	0.8623
	UD1_dir	−1.6516	5.2810	14.96	0.8370	0.8419	0.7872	0.7937
	UD2_dis	−0.0068	0.0149	4.37	0.8799	0.8865	0.8616	0.8667
	UD2_dir	−1.8285	5.0617	11.09	0.7997	0.8088	0.7506	0.7619
Bargaining Coordination and Centralisation	BCO1_dis	−0.0104	0.2779	95.59	0.9935*	0.9942*	0.9901*	0.9910*
	BCO1_dir	−1.7447	1.3577	0.00	0.6650	0.6893	0.6397	0.6652
	BCO2_dis	−0.0147	0.2981	90.49	0.9921*	0.9930*	0.9883*	0.9894*
	BCO2_dir	−2.4595	1.4004	0.93	0.7797	0.7978	0.7276	0.7510
	BCO3_dis	0.1343*	0.6191*	100.00*	1.0000*	1.0000*	1.0000*	1.0000*
	BCO3_dir	−0.1906	3.5132	87.70	0.9942*	0.9938*	0.9883*	0.9885*
	BCO4_dis	0.0941*	0.5923*	100.00*	1.0000*	1.0000*	1.0000*	1.0000*
	BCO4_dir	−0.3320	4.2614	79.81	0.9911*	0.9907*	0.9843*	0.9846*
	BCE1_dis	−0.1356	0.2065	1.16	0.7216	0.7478	0.6682	0.6903
	BCE1_dir	−2.3464	2.3192	0.46	0.7295	0.6851	0.7033	0.6627
	BCE2_dis	−0.1475	0.2216	0.93	0.7012	0.7301	0.6464	0.6705
	BCE2_dir	−2.7740	2.2033	0.00	0.5785	0.5299	0.5956	0.5524
	BCE3_dis	−0.0980	0.3952	64.73	0.9809*	0.9811*	0.9654*	0.9659*
	BCE3_dir	−2.7268	2.6519	10.21	0.6629	0.6184	0.6189	0.5835
	BCE4_dis	−0.0964	0.4225	66.82	0.9829*	0.9829*	0.9674*	0.9679*
	BCE4_dir	−3.7120	2.6672	15.08	0.8397	0.8122	0.7586	0.7348
Replacement Rate	RR1_dis	−0.0087	0.0033	0.40	0.8929	0.8937	0.8868	0.8871
	RR1_dir	−1.8141	0.5774	15.54	0.9188	0.9284	0.8960	0.9065
	RR2_dis	−0.0085	0.0164	3.59	0.8963	0.8922	0.8800	0.8753
	RR2_dir	−1.4651	0.1304	97.81	0.9979*	0.9979*	0.9963*	0.9963*
	RR3_dis	−0.0125	0.0146	0.00	0.5986	0.6031	0.5919	0.5958
	RR3_dir	−0.6088	0.6642	0.00	0.6040	0.6016	0.6017	0.5994
Taxes	TX1_dis	−0.0314	0.0110	6.15	0.8502	0.8523	0.8222	0.8240
	TX1_dir	−0.3829	0.9428	0.00	0.8852	0.8843	0.8784	0.8774
	TX2_dis	−0.0401	0.0433	0.00	0.6779	0.6703	0.6657	0.6583
	TX2_dir	−6.8803	1.4857	46.93	0.9739*	0.9766*	0.9500	0.9531*
	TX3_dis	−0.0063	0.0472	41.48	0.9771*	0.9801*	0.9669*	0.9691*
	TX3_dir	−1.8315	5.3487	19.13	0.9157	0.9251	0.8327	0.8492
	TXW_dis	−0.0059	0.0261	69.13	0.9845*	0.9846*	0.9699*	0.9699*
	TXW_dir	−5.3861	8.9073	25.56	0.9106	0.9098	0.8502	0.8493

Correlation (c=column)
Corr(c6,c8) 0.9877; Corr(c7,c9) 0.9884; Corr(c6,c7) 0.9921; Corr(c8,c9) 0.9935

Note: Column 3-5 contain results belonging to Extreme-Bounds Analysis; Column 3: Lower Extreme Bound; Column 4: Upper Extreme Bound; Column 5: Fraction of Significance. Column 6-9 contain results belonging to Sala-i-Martin's approach, whereas column 6: normal,weighted ; 7: normal,unweighted; 8: non-normal,weighted; 9: non-normal,unweighted. dis refers to distance, dir to direction.
* denotes a robust variable.

Table 5: Test of Robustness, delayed effects, complete results

		Leamer			Sala-i-Martin			
	Variable	UEB	LEB	Sign	n+w	n+uw	nn+w	nn+uw
Employment Protection	EP1_dis	−0.7067	0.8290	0.00	0.7860	0.7612	0.7758	0.7525
	EP1_dir	−2.5491	4.6702	46.89	0.9211	0.8634	0.7951	0.7371
	EP2_dis	−0.2182	0.2786	0.00	0.5771	0.6115	0.5631	0.5951
	EP2_dir	−0.5050	0.8183	0.00	0.7645	0.7864	0.7485	0.7706
Union Density	UD1_dis	−0.0133	0.0188	0.67	0.6127	0.6287	0.5815	0.5979
	UD1_dir	−4.09649	4.7475	14.96	0.5817	0.5814	0.5557	0.5562
	UD2_dis	−0.0133	0.0185	0.50	0.6091	0.6232	0.5790	0.5937
	UD2_dir	−4.9617	4.7502	14.79	0.5814	0.5814	0.5556	0.5562
Bargaining Coordination and Centralisation	BCO1_dis	−0.0926	0.3575	53.60	0.9736*	0.9758*	0.9507*	0.9513*
	BCO1_dir	−3.5111	0.7231	69.84	0.9985*	0.9968*	0.9804*	0.9762*
	BCO2_dis	−0.1274	0.3635	40.14	0.9573*	0.9607*	0.9182	0.9190
	BCO2_dir	−3.4338	1.2369	38.68	0.9824*	0.9738*	0.9190	0.9145
	BCO3_dis	0.1836*	0.7689*	100.00	1.0000*	1.0000*	1.0000*	1.0000*
	BCO3_dir	−4.5501	0.6184	75.87	0.9974*	0.9957*	0.9817*	0.9800*
	BCO4_dis	0.1227	0.7422	100.00	1.0000*	1.0000*	0.9999*	1.0000*
	BCO4_dir	−5.4031	1.1381	61.25	0.9937*	0.9904*	0.9684*	0.9661*
	BCE1_dis	−0.1875	0.4614	25.75	0.7394	0.8289	0.5735	0.6600
	BCE1_dir	−3.6236	1.1351	54.99	0.9830*	0.9744*	0.9612*	0.9505*
	BCE2_dis	−0.1857	0.4315	28.31	0.7320	0.8214	0.5678	0.6498
	BCE2_dir	−4.4155	1.7653	31.09	0.9460	0.9318	0.9137	0.8958
	BCE3_dis	−0.1877	0.5555	54.99	0.9679*	0.9699*	0.9420	0.9436
	BCE3_dir	−2.2603	4.2230	36.66	0.9575*	0.9085	0.7923	0.7349
	BCE4_dis	−0.2040	0.5626	53.36	0.9690*	0.9707*	0.9418	0.9423
	BCE4_dir	−2.4832	5.3913	38.52	0.9779*	0.9499	0.8410	0.7968
Replacement Rate	RR1_dis	−0.0156	0.0038	50.60	0.9730*	0.9771*	0.9586*	0.9636*
	RR1_dir	−1.7891	1.1562	1.59	0.8249	0.7786	0.7855	0.7407
	RR2_dis	−0.0172	0.0193	1.99	0.7296	0.6839	0.7021	0.6600
	RR2_dir	−1.0945	0.5556	0.00	0.8269	0.8181	0.8165	0.8086
	RR3_dis	−0.0268	0.0175	0.00	0.6489	0.6928	0.6252	0.6660
	RR3_dir	−1.1161	0.2539	74.50	0.9837*	0.9835*	0.9734*	0.9737*
Taxes	TX1_dis	−0.0355	0.0151	0.00	0.7575	0.7626	0.7283	0.7321
	TX1_dir	−1.7602	0.2895	68.30	0.9797*	0.9796*	0.9767*	0.9765*
	TX2_dis	−0.0547	0.0442	0.00	0.5285	0.5388	0.5222	0.5311
	TX2_dir	−5.2468	4.7653	2.51	0.7765	0.7543	0.7521	0.7309
	TX3_dis	−0.0380	0.0355	0.00	0.5598	0.5689	0.5531	0.5620
	TX3_dir	−4.7638	2.6537	1.96	0.8088	0.8126	0.7815	0.7893
	TXW_dis	0.0014*	0.0410*	100.00	0.9993*	0.9993*	0.9989*	0.9989*
	TXW_dir	−12.6176	1.7651	92.18	0.9960*	0.9961*	0.9913*	0.9914*

Correlation (c=column)
Corr(c6,c8) 0.9595; Corr(c7,c9) 0.9506; Corr(c6,c7) 0.9834; Corr(c8,c9) 0.9850

Note: Column 3-5 contain results belonging to Extreme-Bounds Analysis; Column 3: Lower Extreme Bound; Column 4: Upper Extreme Bound; Column 5: Fraction of Significance. Column 6-9 contain results belonging to Sala-i-Martin's approach, whereas column 6: normal,weighted ; 7: normal,unweighted; 8: non-normal,weighted; 9: non-normal,unweighted. dis refers to distance, dir to direction.
* denotes a robust variable.

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