Peer Effects in Central Banking

Roman Horváth
Institute of Economic Studies, Charles University, Prague

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Abstract

We provide a new explanation for why central banks became transparent over the last two decades. We apply recently developed social interaction panel regression models for the observational data, which allow the identification of peer effects. The identification is based on the variation in the past monetary policy regime exogenously determined with respect to transparency. Previous literature has argued that domestic factors, such as macroeconomic stability, were behind the trend toward greater transparency. In contrast, our results indicate that transparency primarily increased because of a favorable global environment and, importantly, because of the peer effects among central bankers. Central bankers thus learned from each other's experiences regarding transparency. To our knowledge, our paper is the first econometric analysis of peer effects among public institutions or in the macroeconomic literature.

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Contacts: Roman Horváth, Institute of Economic Studies, Charles University, Opletalova 26, Prague 1, 110 00, Czech Republic. E-mail: roman.Horváth@gmail.com

1 Introduction

Central banks substantially increased the transparency of their policies over the last two decades (Eichengreen and Dincer, 2014, Geraats, 2009, Posen, 2003). Currently, these policies are explained to the public in great detail. An extensive body of literature has analyzed the causes of this movement toward greater transparency (see Crowe and Meade, 2008, Eichengreen and Dincer, 2014, or Eijffinger and Geraats, 2006, among others). This literature typically concludes that the determinants of transparency are largely internal to each domestic policy or to domestic macroeconomic characteristics. It does not consider that central banks interact with each other (Borio et al., 2008) and learn from the policy experiments of their peers.[1]

Central banks typically have much stronger ties among themselves on the international level than other public institutions do. These banks meet and discuss their policies and operations on a regular basis and have created several frameworks, such as the Central Bank Governance Forum at the Bank for International Settlements, to facilitate these discussions, including discussions related to governance and its various aspects, such as transparency. As a result, central bank transparency is likely to be *influenced* not only by domestic economic, political, and institutional variables but also directly by the transparency of *other* central banks and their characteristics. In addition, many central banks transfer their know-how to their peers formally by offering so-called technical assistance.[2]

[1] A number of central bankers document the high level of central bank interaction, even within the area of transparency. The Deputy Governor Jan F. Qvigstad of the Norges Bank at the Norwegian Academy of Science and Letters on 10 November 2009 noted,"*Our view on transparency and good communication is inspired by Wim Duisenberg, the first President of the European Central Bank*" and continued his speech by analyzing the experience of the Bank of England and Sveriges Riksbank with transparent central bank policies. Thomas Jordan, a Governor of the Swiss National Bank (SNB), emphasized during his speech at Zürcher Volkswirtschaftliche Gesellschaft on January 16, 2014, that "*the SNB is carefully monitoring international debates about the right objective and the best way of communicating monetary policy. Nevertheless, no central bank should simply jump on the latest monetary policy bandwagon without careful consideration*". When the National Bank of Moldova presented its new strategic plan for 2013-2017, Governor Dorin Drăguţanu said to centralbanking.com on October 3, 2012, that "*the plan considered the best practice and experiences of other central banks*"." Further, the strategic plan itself noted that "*As any other modern entity, the NBM shall ensure a high level of efficiency, transparency and performance, by aligning to the best international practices related to communication, credibility and corporate governance*".The General Manager of the Bank of International Settlements, Malcolm D. Knight noted, that "*an important aim has always been to help central banks learn from each other, deepening mutual understanding*" (BIS, 2006). Woodford (2007) argues that the U.S. should learn from the communication policies of inflation-targeting central banks.

[2] Some central banks, such as the Czech National Bank, provide this assistance for up to 20 central banks around the world (see, for example, the Czech National Bank press release from November 12, 2009). Others, such as the Bank of England, establish train-

The empirical analysis of peer effects and social networks is a small but growing body of literature. So far, however, it has focused on fields other than monetary economics or macroeconomics. Bayer et al. (2008) and Calvó-Armengol et al. (2009) examine peer effects issues in health economics and education economics, respectively. Conley and Udry (2010) investigate how farmers learn about new technologies. Saez and Duflo (2003) analyze participation in retirement plans. Bertrand et al. (2000) examine welfare cultures; Blume et al. (2015) provide a survey of the econometric literature on social interactions.[3]

The crucial issue in the social interactions literature is the identification of peer (endogenous) effects, or how to distinguish peer effects from contextual (exogenous) or unobserved correlated effects. Central banks may change their level of transparency in tandem because they operate in a synchronized economic environment (this is labeled contextual effects). Central banks may also change their level of transparency because of some unobserved effects. In both cases, the changes in the level of transparency are correlated across the central banks but may be independent.

The identification of endogenous, contextual, and correlated effects often requires experimental data. However, Lee (2007) proposes the use of observational data to estimate and identify social interaction models, showing that identification is possible with sufficient peer group size variation (see also Lee et al., 2010). Individuals interact in the groups, and the size of group must vary sufficiently. Furthermore, there must typically be at least three groups for the model to be identifiable. We utilize this important finding.

Our identification strategy is based on the assumption that the peers of central banks are those banks that maintain the same monetary policy regime and that different policy regimes (groups) are of sufficiently different size. Sorting into different group (i.e. into the same monetary policy regimes) should be exogenous with respect to the dependent variable (i.e. central bank transparency) and therefore, we use the monetary policy regime as of the year 2000 and exam-

ing centers to transfer their knowledge (see their Centre for Central Banking Studies at http://www.bankofengland.co.uk/education/pages/ccbs/default.aspx).

[3]These models have been typically applied to analyze individual behavior. The decisions at central banks are typically collective (Reis, 2013) and are made by a handful of central bank officials, although they are sometimes strongly influenced by the governor (Blinder et al., 2008). The average number of monetary policy committee members at a global scale is approximately 5-7, which is slightly higher than the typical household. The peer effects among households in terms of consumption are examined by Maurer and Meier (2008) and Krishnan and Patnam (2014).

ine the existence of peer effects in the period after the year 2000. Our results show that peer effects are systematically significant.[4]

As an alternative to our identification scheme, we utilize the inverse of geographical distance as a measure of interaction among central bankers and therefore estimate a more traditional spatial econometric model. Though distance does not, in principle, solve identification issues, Buera et al. (2011) note that the identification problem is much less severe because a central bank is likely to discount information from all other central banks differently depending on their geographical locations. This feature breaks the symmetry that causes the collinearity problem, as they put it. Therefore, our alternative models with geographical distance closely resemble studies examining the diffusion of policy experiments, such as Simmons and Elkins (2004).[5]

There are only a handful of applications of Lee's (2007) model. Boucher et al. (2014) appear to provide the first application. They examine peer effects in student achievement in secondary schools. Our innovation is to examine the diffusion of policy experiments among public institutions (namely, central bank transparency). Unlike the previous literature, however, we emphasize model identification to pinpoint the specific sources behind changes in the level of transparency. Without identification, the estimated parameters in the reduced form models do not have a clear interpretation. In addition, some types of interaction effects cause the typically used ordinary least squares to be inefficient and biased.

We examine the determinants of central bank transparency in the area of monetary policy.[6] Our regression specifications largely follow the earlier literature, such as the study of Dincer and Eichengreen (2014). Our extension explicitly accounts for both peer effects and contextual effects. Therefore, our analysis may elucidate the extent to which the central banks learn from each other. To our knowledge, this approach is novel for the central bank learning literature. This literature currently focuses on learning within a central bank or on how the public learns about central bank objectives.

[4] Instead of actual monetary policy regimes, we also generate the regimes randomly and our results rightly show that peer effects are not present in this case.

[5] Gibbons and Overman (2012) discuss the importance of identification for applied spatial econometric model exercises and argue that without proper identification, spatial econometrics is pointless. Volden et al. (2008) show formally that the diffusion of policy experiments due to learning from each others' experiences is often indistinguishable from the independent adoption of policy experiments and therefore, an identification strategy to distinguish between these two effects is critical.

[6] In one of our robustness checks, we also use data on how central banks are transparent about their financial stability assessment from Horvath and Vasko (2016).

The theoretical underpinning for our econometric exercises is provided by, among others, Anderlini and Ianni (1996), who show that subjects tend to learn more from their neighbors and that there is a strong path dependence in learning. Volden et al. (2008) and Callander and Harstad (2015) provide relevant theoretical models that examine the propensity to experiment with policies when districts learn from each other. Importantly for our research, Calvo-Armengol et al. (2008), Davezies et al. (2009), and Lin (2010) provide a theoretical model of peer effects and demonstrate that once we introduce these effects into the utility of welfare-maximizing agents, their optimal behavior will have a spatial structure.

Our results contribute to three different streams of literature. First, we provide a novel explanation for the causes of changes in central bank transparency. Second, in contrast to previous literature, we properly identify the specific sources behind the diffusion of policy adoptions. Third, we take a different perspective on central bank learning and show how central banks learn from each other.

More specifically, our results provide evidence of peer effects among central banks. In contrast to the previous literature on central bank transparency, our results indicate that domestic factors are not the only driving force behind the increases in transparency. External factors and peer effects also play an important role. Consequently, our results improve the understanding of why central banks became transparent. Central banks observed the experience of frontrunners and followed their decisions, if the central banks evaluated the frontrunners' experience with more transparent policy framework as positive. This finding has important implications for the theoretical literature on central bank transparency. It may be worth modeling not only how private agents learn about central bank policies but also how central banks learn from each other. Our results also extend the previous literature on the diffusion of policy adoptions (or policy experiments), which argues that there is a diffusion but did not evaluate the question whether the policy adoptions – although correlated over time – are independent. This is so because the previous literature did not address identification issues.

This paper is organized as follows. Section 2 provides a brief survey of the theoretical and empirical literature on central bank transparency. Section 3 introduces the data, the illustrative theoretical model, and our econometric framework. Section 4 provides the empirical results, and Section 5 concludes

the paper. An appendix with data definitions and additional regression results follows.

2 Central Bank Transparency: A Brief Survey

This section provides a brief survey of the theoretical and empirical literature on central bank transparency. A survey on central bank communication is provided by Blinder et al. (2008). Reis (2013) surveys the literature on central bank design, including transparency issues.

2.1 Theory

An important strand of the theoretical literature on central bank transparency focuses on the social welfare effects of public information. Morris and Shin (2002) emphasize that the benefits of greater transparency among public institutions may be limited if private agents have access to independent sources of information. Their model implies that the greater dissemination of information by public institutions may crowd-out the information gathered by private agents and decrease welfare if the public signal about fundamentals is imprecise. Svensson (2006) employs the Morris and Shin (2002) model but concludes that their result is, in fact, pro-transparency because the setting in which more public information would have detrimental effects is exceptional. James and Lawler (2011) extend Morris and Shin (2002) by considering not only the dissemination of public information but also public policy actions. They conclude that greater public information dissemination unambiguously decreases welfare. Similarly, Lepetyuk and Stoltenberg (2013) are skeptical regarding transparency. They show that greater transparency in the form of monetary policy announcements, for example, may decrease welfare, even when individual preferences coincide with social welfare.

Several other papers extended the framework of Morris and Shin (2002) in various directions; see, for example, Angeletos and Pavan (2007) or Cornand and Heinemann (2008). Although their results might be viewed as less skeptical regarding the benefits of transparency, they suggest that the optimal degree of publicity depends on the precision of the announcements. Other models also emphasize the idea of announcement precision and argue that the disclosure of certain information or disclosure to selected market participants is welfare-improving (Dale et al., 2011). Kool et al. (2011) show that greater transparency,

even with accurate forecasts, is not beneficial if it crowds out private information. Cukierman (2009) also stresses the limits to transparency; for example, transparency that is too high could induce bank runs. More generally, these models suggest that there is some optimal level of transparency (see Walsh, 2007, or van der Cruijsen et al., 2010).

2.2 Empirical Evidence

The empirical literature typically focuses on testing the benefits and costs of various aspects of transparency. Again, there is some heterogeneity in the findings regarding whether transparency is welfare-improving. Crowe (2010) finds that the adoption of an inflation-targeting regime helps reduce the size of forecast errors. Ehrmann et al. (2012) show that greater central bank transparency reduces the forecast dispersion of professional forecasters but that the effect is weak on the inflation expectations of the general public. Gerlach-Kristen (2004) and Horváth et al. (2012) find that the release of voting records from the monetary policy meetings of various inflation targeting central banks helps predict the future course of monetary policy, supporting a case for transparency. However, Meade and Stasavage (2008) examine the transcripts from the Federal Reserve's monetary policy meetings and find that the decision to release full transcripts of Federal Open Market Committee meetings decreased the incentives of its participants to voice dissenting opinions.

Although there is discussion in the literature about the benefits and costs of central bank transparency, central banks have increased the transparency of their policies substantially over the last two decades. Dincer and Eichengreen (2014) document this shift using their monetary policy transparency index for a global sample of countries. Similarly, Horváth and Vaško (2016) develop an index of central bank transparency regarding their policy frameworks to promote financial stability and find that most central banks worldwide increased their transparency extensively in the 2000s. The achieved level of monetary policy transparency has rarely decreased, according to Dincer and Eichengreen (2014). Similarly, few central banks exhibited a decrease in their financial stability assessment transparency index; those that did were the most strongly affected by the current global financial crisis. These central banks even stopped publishing their financial stability reports, which is a major communication channel for central banks regarding financial stability issues (Horváth and Vaško, 2016).

The monetary policy transparency index developed by Dincer and Eichengreen (2014) builds on earlier contributions that gauge monetary policy transparency. Notably, Eijffinger and Geraats (2006) classify transparency in five areas: (1) political transparency, (2) economic transparency, (3) procedural transparency, (4) policy transparency, and (5) operational transparency. Based on these classifications, they generate transparency indexes for nine central banks. More recent studies assess the transparency of central bank policies for issues other than monetary policy. Liedorp et al. (2013) provide an index of transparency for banking supervisors in 24 countries. Horváth and Vaško (2016) provide an index of central banks' transparency in terms of their framework to assess financial stability. The index is available for 110 countries on a yearly basis from 2000 to 2011.

Some studies, such as that by Liedorp et al. (2013), find that the determinants of transparency are largely country-specific. Dincer and Eichengreen (2014) and Horváth and Vaško (2016) find systematic variation in the degree of transparency. The results of Dincer and Eichengreen (2014) suggest that inflation, openness, financial depth, institutional quality, and political stability determine the level of transparency. Horváth and Vaško (2016) find that the degree of transparency in the area of financial stability is strongly influenced by previous experience with monetary policy transparency. In addition, more developed countries that experience lower financial stress also exhibit a higher transparency score.

3 Data and Social Interaction Models

3.1 Data

We use the monetary policy transparency (MPT) index in 2000-2010 provided by Dincer and Eichengreen (2014). The resulting MPT index of central bank transparency is the sum of the scores of the answers to fifteen questions on political transparency, economic transparency, procedural transparency, policy transparency, and operational transparency. As an alternative, we also use the financial stability assessment transparency (FST) index developed by Horváth and Vaško (2016), which is available for 2000-2011. The resulting FST index is the sum of the scores of the answers to eleven questions on the general framework of political transparency, the coverage of financial stability reports, the availability of stress tests and financial soundness indicators, and information

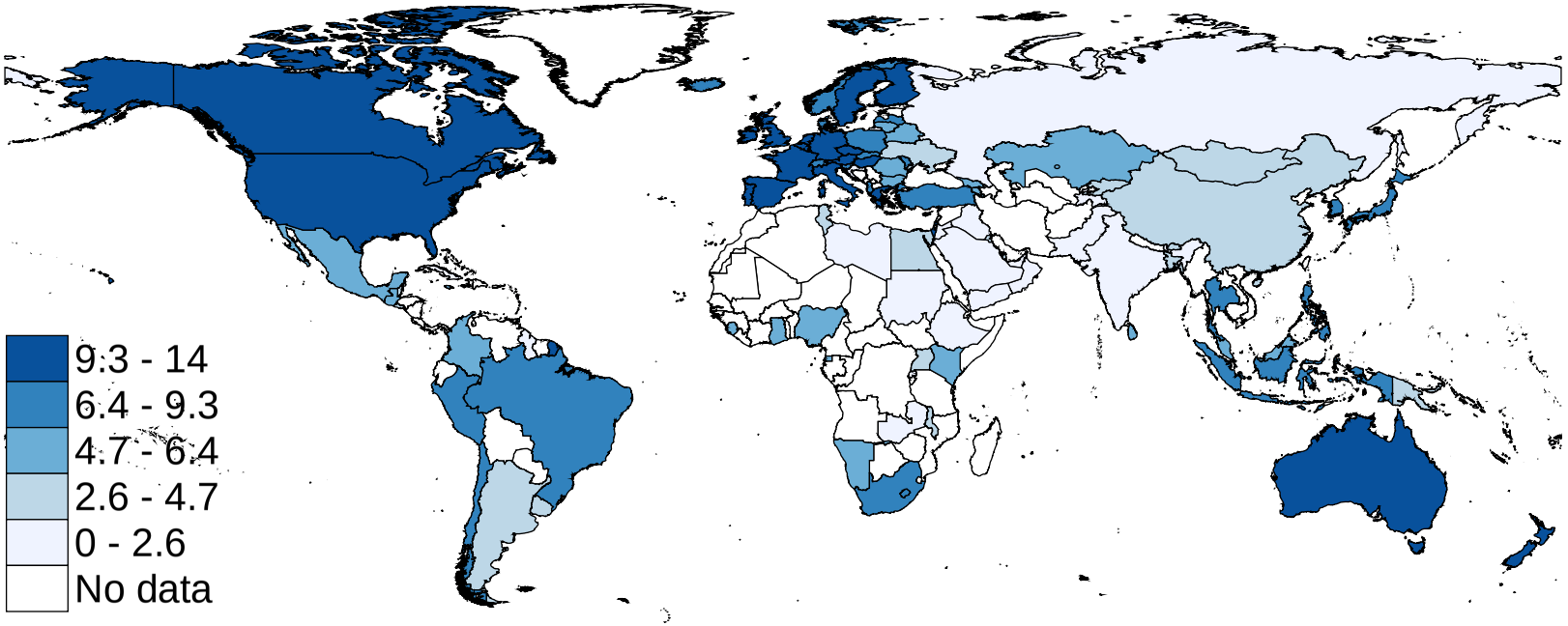
about financial stability provided on the websites of central banks. We use the financial stability transparency index for the robustness checks because our identification scheme is based on the monetary policy regime, which is obviously more plausible for MPT index than for FST index.

The data for both transparency indexes are drawn from central bank websites. Both indexes are available for more than 100 central banks worldwide, and only small countries are not covered.[7] The average monetary policy transparency scores are presented in Figure 1 and illustrate the cross-country heterogeneity in the MPT index. More developed countries exhibit higher transparency scores, but many Central and Eastern European countries with inflation-targeting regimes do so as well. The average transparency scores for FST index are available in the online Appendix. The transparency score change frequently, approximately the value of every third observation changes with respect to previous year (see Dincer and Eichengreen, 2014, and Horvath and Vasko, 2016).

We use the identical set of explanatory variables as in the study on the determinants of monetary policy transparency by Dincer and Eichengreen (2014) to impose some structure on the regression specifications. The list of explanatory variables covers economic, financial, and political/institutional variables. With regard to the economic variables, we use inflation, GDP per capita, and openness. Our financial variable is financial depth (credit to GDP ratio). The political/institutional variables include political stability, rule of law, voice and accountability, government efficiency, and regulatory quality. The data definitions and sources are available in the Appendix.

[7]The European Central Bank data are used to assess monetary policy transparency in the euro area and the explanatory variables are averaged across the member countries in this case (unless they are readily available at the euro area aggregate level). Financial stability transparency is assessed at the country level. It is noteworthy that our results remain largely the same if we exclude the euro area countries from our sample. The list of countries is as follows: Albania, Argentina, Armenia, Aruba, Australia, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belize, Bermuda, Bhutan, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Cuba, Czech Republic, Denmark, Egypt, El Salvador, Estonia, Ethiopia, Euro Area countries, Fiji, Georgia, Ghana, Guatemala, Guyana, Hong Kong, Hungary, Iceland, India, Indonesia, Iraq, Israel, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea, Kuwait, Kyrgyzstan, Latvia, Lesotho, Libya, Lithuania, Malawi, Malaysia, Malta, Mauritius, Mexico, Mongolia, Namibia, New Zealand, Nigeria, Norway, Oman, Pakistan, Papua New Guinea, Peru, Philippines, Poland, Qatar Republic, Moldova, Romania, Russian Federation, Rwanda, Saudi Arabia, Sierra Leone, Singapore, Slovak Republic, Slovenia, Solomon Islands, South Africa, Sri Lanka, Sudan, Sweden, Switzerland, Tajikistan, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, Uruguay, USA, Vanuatu, Yemen, and Zambia.

Figure 1: Country Heterogeneity in Monetary Policy Transparency



Note: The average 2000-2010 scores for the monetary policy transparency index are presented.

3.2 Illustrative model

In this sub-section, we provide an illustrative model of how central banks choose their level of transparency with respect to their peers. The model motivates the structure we impose on the regressions in the following section. The model is conceptually similar to the richer theoretical models such as Callander and Harstad (2015), who study the framework, where benefits of policy experiments in the district A directly affect the benefits of policy experiments in the district B or to the models of social learning (see, for example, Lamberson, 2010), where agents learn from each other within their network.

In our model, we follow Calvó-Armengol et al. (2008) and Davezies et al. (2009). The inherent feature of the model is that central bank derives utility from observing policy experiments of its peers. Why is it reasonable to assume that the utility of central bank i depends on the utility of central bank j and vice versa? First, somewhat tautologically, we show anecdotal evidence in the previous section, which suggests that central bankers learn from each other experiences with respect to transparency. So, the illustrative model laid out below would be in line with this anecdotal evidence. Second, it might also be useful to think about learning among central banks as some sort of implicit risk sharing. The effects of transparency on welfare are difficult to evaluate *a priori*, so central banks may observe their peers and economize on possible costs associated with policy experiment. At the same time, observing the actions of peers comes at rather low cost.

Suppose that e_i is the continuous choice variable of central bank i, which belongs to a peer group (a group with identical monetary policy regime) of size m, x_i is the i-th exogenous covariates capturing the economic, financial, or institutional characteristics, and ε_i is its (random) central bank-specific characteristic. Let the utility stemming from the transparency choice e_i be given by Eq. (1), and let the other central banks in the group choose $(e_j)_{j\neq i}$:

$$U_i(e_i,(e_j)_{j\neq i}) = e_i\left[x_i\beta_1 + \left(\frac{1}{m-1}\sum_{j=1,j\neq i}^{m} e_j\right)\lambda + \left(\frac{1}{m-1}\sum_{j=1,j\neq i}^{m} x_j\right)\beta_2 + \alpha + \varepsilon_i\right] - \frac{1}{2}e_i^2 \tag{1}$$

In this framework, the marginal returns of central bank i depend on its own characteristics x_i, its peers' choices $(e_j)_{j\neq i}$, their observable (exogenous) characteristics $(x_j)_{j\neq i}$, and a group fixed effect α. It is reasonable to assume that the

group fixed effect, the peers' choice variable, and the exogenous characteristics are observed.

We assume that the utility of central bank i depends on the transparency efforts of central bank j. This assumption can be rationalized by the fact that the policy experiments (and the associated information gathering to prepare eventual policy experiment) can be costly and therefore, observing the behavior of other central banks is a way to reduce costs and increase the efficiency of central bank policies.

It can be shown that the Nash equilibrium of the game $(y_1^*, ..., y_m^*)$ is

$$y_i^* = x_i\beta_1 + \left(\frac{1}{m-1}\sum_{j=1,j\neq i}^{m} y_j^*\right)\lambda + \left(\frac{1}{m-1}\sum_{j=1,j\neq i}^{m} x_j\right)\beta_2 + \alpha + \varepsilon_i \qquad (2)$$

Following the terminology introduced by Manski (1993), λ represents the endogenous peer effect, β_2 represents the exogenous (contextual) effect, y_i^*denotes the resulting transparency scores and α represents the correlated effect. The model in Eq. (2) resembles that of Manski (1993), but on the right-hand side of Eq. (2), the expectations relative to the entire group and the covariates in the group of peers are replaced by the means of the outcomes. Davezies et al. (2009) show that the original Manski (1993) approach corresponds to the Bayesian Nash equilibrium when the agents do not observe the characteristics of its peers and must form expectations about them. Nevertheless, we believe that the model in Eq. (2) is more plausible because these characteristics such as inflation or economic activity are observed.

3.3 Social interaction regression models

We estimate the social interaction model of Eq. (2) from the previous subsection to examine what drives central bank transparency. To simplify notation, we can write it as the Lee (2007) model in a matrix notation

$$y = \lambda W y + x\beta_1 + Wx\beta_2 + \alpha + e, \qquad (3)$$

where y denotes the dependent variable (the index of central bank transparency),[8] x is a vector of explanatory variables, W is a social network weighting

[8]Bramoulle et al. (2009) estimate the peer effects model as in Eq. (3) to analyze participation in recreational activities. The dependent variable in their model is an index of

$N \times N$ matrix, α is a group fixed effect, and e is a residual with $u \sim N\left(0, \sigma^2 I_n\right)$. The social groups in W are defined based on whether different central banks share the same monetary policy regime. If so, the value of the corresponding cell in the matrix is one, and it is zero otherwise. W is then row normalized so that Wy and Wx can be interpreted as the weighted average outcome of the peers. We distinguish four main monetary policy regimes, R, based on the International Monetary Fund classification: inflation targeting, exchange rate anchoring, monetary targeting, and other regimes (the source of data is the International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions). These group sizes, m, are different. We classify countries according to the monetary policy regime as of 2000 and estimate the regression model for 2001-2010. As a consequence, sorting into different monetary policy regimes is exogenous with respect to our dependent variable. We have 36 countries with exchange rate anchoring, 13 with monetary targeting, 16 with inflation targeting, and 45 with another regime, including fund-supported or other monetary programs and IMF-supported or other monetary programs. As an alternative, we classify countries according to the most common monetary policy regime that they had in 2000-2011.[9] The model is estimated using conditional maximum likelihood.

The statistically significant λ indicates that peer effects are present for decisions about transparency. A significant β_2 would suggest that the environments within the central bank's peers operate matter for transparency. For example, if peers exhibit low inflation, the central bank may mimic their level of transparency. The significance of β_1 indicates that domestic factors are important drivers of transparency. The previous literature has estimated the restricted version of Eq. (3), specifically $y = x\beta_1 + \alpha + e$, and ignored contextual and peer effects.

As an alternative, we use a W based on the inverse of distance in kilometers among the country's capital cities.[10] Therefore, we assume that central banks that are located geographically close to each other are more likely to be influ-

participation with values from 0 to 4. Therefore, the nature of their dependent variable is identical to our central bank transparency indexes.

[9] In this case, we have 34 countries with exchange rate anchoring, 16 with monetary targeting, 27 with inflation targeting, and 33 with another regime, including fund-supported or other monetary programs and IMF-supported or other monetary programs.

[10] Despite commonly held beliefs, LeSage and Pace (2011) show that the statistical inference in spatial econometric models is not very sensitive to the particular specifications used for the spatial weight structure in these models. Our results presented in the following section support this finding.

enced by each other than are central banks that are geographically distant.[11] This assumption is consistent with Egger et al. (2014), who use geographical distance to proxy how exporting firms update beliefs (i.e., how they learn) about foreign markets; with Helmers and Patnam (2014), who examine spatial peer effects among children in India; and with Buera et al. (2011), who investigate the growth of nations. Clearly, learning is unobserved and is likely to be mediated through a common monetary policy regime or geographical distance (i.e., a central bank is more likely to emulate policy of its geographic neighbors than to emulate other central banks, see, for example, Simmons and Elkins, 2004, for related literature on the diffusion of policies). It is, however, worth noting that it is also important to control for confounding factors to identify learning (Conley and Udry, 2010). We discuss this issue in the following section in greater detail.

Lee's (2007) model assumes that peer groups are known, which fits well with our case because the monetary policy regimes are observable.[12] It is assumed that central banks interact within this group but not outside it. This assumption is widely applied in the social interactions literature. We are aware that there might be at least some level of interaction among central banks with different policy regimes, especially if they are geographically close. Therefore, we conduct robustness checks using the inverse of geographical distance as a measure of the degree of interaction. Another assumption of Lee's (2007) model is that the central bank's peer group is everyone but the central bank itself. This assumption is important for identification (Lee, 2007), and it is one of the main differences from the widely applied linear-in-means model by Manski (1993).

Lee's (2007) model is theoretically identified but may suffer from weak identification with actual data. Therefore, Lee (2007) undertakes Monte Carlo simulations to examine the extent to which maximum likelihood and instrumental variable estimators converge to true values for different R (the number of groups) and m (the size of group).[13] Boucher et al. (2014) conduct additional Monte Carlo simulations to investigate the effects of both group sizes and their distribution on the precision and bias of the estimates. They find that the greater

[11] It is worth noting that an alternative such as the trade intensity among countries could, in principle, work as well, but trade links are instrumented by geographical distance in most empirical research on international trade.

[12] Note that Davezies et al. (2009) show that Lee's (2007) model is identifiable even if group members are not observed.

[13] Lee (2007) also finds that conditional maximum likelihood estimates are more efficient than are those from two-stage least squares. Therefore, we do not estimate Eq. (3) using the latter technique.

standard deviation of group sizes helps identification. Comparing R , m, and its standard deviation from our study with the results presented in Table 6 in Boucher et al. (2014), it is likely that the bias of our estimates is very small. In addition, we also conduct our own Monte Carlo simulations and show that the bias is indeed small in our data (more on this in the following section).

4 Results

This section contains our results regarding the determinants of central bank transparency. We estimate different social interaction regression models and present the results for both the determinants of monetary policy transparency and the determinants of financial stability transparency. We closely follow the regression specifications of Dincer and Eichengreen (2014) but extend their empirical model to include peer and contextual effects.

4.1 Baseline Results

Table 1 presents our results on the determinants of monetary policy transparency with the social network matrix based on the common monetary policy regime. The monetary policy regime is as of 2000 and the regressions are estimated for 2001-2010 so that the monetary policy regime is exogenous to central bank transparency. According to our results, domestic characteristics help explain monetary policy transparency only to a certain extent, which is in line with Dincer and Eichengreen (2014). Monetary policy transparency has additionally been influenced by the economic and institutional environments of central bank peers. Peer effects are present for decisions regarding monetary policy transparency.

Our results provide two primary policy implications. First, policy interventions such as those by international organizations targeting only a subset of central banks may influence outcomes for other central banks that are not directly included in the intervention. Because of peer effects, the changes in individual covariates become amplified and therefore, even relatively small shocks may have implications for central bank transparency at the global level.

Second and relatedly, peer effects among central banks decrease dispersion in the level of transparency, and some central banks may become too transparent given the state of financial or macroeconomic stability. This argument can be vividly illustrated with the transparency regarding the communication

Table 1: **The Determinants of Monetary Policy Transparency: Do Peer Effects Matter?**

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Inflation	1.22	1.41	1.48	1.25	-2.91	-2.27	6.84	8.82*
	(2.18)	(2.22)	(4.72)	(2.19)	(2.15)	(5.34)	(5.33)	(2.12)
Openness	0.01*	-0.00	0.01*	0.01	0.01**	0.01	-0.01	0.01**
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Financial depth	0.003	0.003	0.003	0.03***	0.01	0.00	0.00	0.02
	(0.004)	(0.004)	(0.004)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
GDP per capita	0.00	0.00*	0.00*	0.00	0.00	0.00***	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rule of law	-0.03							
	(0.22)							
Political stability		0.06						
		(0.13)						
Voice and acc.			0.14					
			(0.21)					
Government eff.				0.14				
				(0.19)				
Regulatory qu.					0.84***			
					(0.17)			
Democracy						0.06		
						(0.04)		
Autocracy							-0.02	
							(0.04)	
Polity score								0.02
								(0.02)
W*Inflation	1.46	-0.61	1.35	-1.65	1.56	9.52*	-2.15	-2.21
	(4.65)	(4.82)	(2.20)	(4.72)	(4.62)	(2.11)	(2.13)	(5.34)
W*Openness	-0.00	0.01	0.01	0.01*	0.02	0.01**	0.01*	0.00
	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)
W*Financial d.	0.03***	0.03**	0.04***	0.00	0.04***	0.02*	0.02	0.00
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
W*GDP p.c.	0.00	0.00	0.00	0.00	0.00	0.00	0.00**	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
W*Rule of law	6.11***							
	(1.15)							
W*Political stab.		0.43						
		(0.53)						
W*Voice and acc.			3.20***					
			(1.05)					
W*Gov. eff.				3.71***				
				(0.98)				
W*Reg. quality					3.75***			
					(0.81)			
W*Democracy						0.84***		
						(0.18)		
W*Autocracy							-0.92***	
							(0.24)	
W*Polity								0.49***
								(0.11)
Peer effects (λ)	0.11	0.38***	0.30***	0.25***	0.06	0.24***	0.32***	0.26***
	(0.10)	(0.07)	(0.08)	(0.09)	(0.11)	(0.08)	(0.08)	(0.08)
Observations	729	729	729	729	729	720	720	720

Note: Standard errors are shown in parentheses; ***, ** and * denote statistical significance at the 1, 5 and 10 % level, respectively. W denotes the social network matrix based on the monetary policy regime as of 2000, while dependent and explanatory variables are from 2001-2010.

of financial stability issuwss (the regression results are available in the following sub-section). This result could decrease social welfare, as Morris and Shin (2002) note. There is an optimal level of transparency in the central bank framework to promote monetary (or financial) stability, which is likely to depend on the business or financial cycle. During bad times, central bank communication regarding financial stability becomes a delicate issue because transparently revealing the poor state of the financial sector and its risks may lead to bank runs and to an escalation of the crisis (Goldstein and Sapra, 2014). In fact, Horváth and Vaško (2016) document that central banks in the countries that were most strongly hit by the financial crisis temporarily decreased their transparency regarding financial stability issues to a large extent. For example, central banks in several European countries did not publish financial stability reports during the recent crisis. It is noteworthy that the decision to decrease transparency is likely to be associated with substantial reputational costs.

It is important to note that our primary result – the existence of peer effects – holds even if we control for a number of economic, financial, monetary, institutional, and political characteristics of the countries and for fixed effects. Controlling for these characteristics is important for reducing the risk that the significance of peer effects does not represent the omission of some important variable. Ignoring group fixed effects may lead to the overestimation of the degree of peer effects because central banks may sort into different monetary policy regimes based on some unobserved characteristics.

4.2 Robustness Checks

We subject our results to a number of additional robustness checks. These results are available in the Appendix. First, we estimate our regressions when in order to calculate W monetary policy regime is no longer set as of 2000 but as the most common regime in 2000-2010. Second, we generate the matrix W based on geographical distance instead of monetary policy regime and estimate the determinants of monetary policy transparency. Third, we estimate the regressions with lagged dependent variable (and explanatory variables), i.e. introducing time dynamics into the peer effects. Fourth, we re-estimate the baseline regressions and additionally control for time effects to capture the potential time-varying unobserved heterogeneity. Fifth, we estimate regressions when financial stability transparency index is used instead of monetary policy transparency. Sixth, we generate the matrix W based on geographical distance

instead of monetary policy regime and estimate the determinants of financial stability transparency. Seventh, we estimate regressions with financial stability transparency index as the dependent variable and additionally extend the set of regressors by including the variable controlling for the institutional structure of financial market supervision. Eight, we estimate regressions with financial stability transparency index as the dependent variable and additionally extend the set of regressors by including the variable controlling for the institutional structure of financial market supervision but with the matrix W based on geographical distance instead of monetary policy regime. Ninth, we re-estimate our regressions with lagged dependent variable to introduce dynamics in our model examining the determinants of monetary policy transparency. Tenth, we estimate the determinants of monetary policy transparency for each year separately to address potential time varying unobserved heterogeneity. Eleventh, importantly, we estimate our regressions with randomly generated W. Twelfth, we estimate regressions to examine the determinants of monetary policy transparency with random effects instead of fixed effects. Thirteenth, we conduct Monte Carlo simulations to investigate the size of bias of our consistent estimator. We discuss these robustness chcecks below and show largely support for baseline findings.

Table A.1 provides the regression results, where W is based not on the monetary policy regime as of 2000 but based on the most common monetary policy regime in the 2000s. Therefore, W is no longer exogeneous but based on the most representative monetary policy regime. The baseline results regarding the peer effects are virtually unchanged.

Next, the degree of interaction among central banks is also influenced by whether they are geographically close to each other. As noted in our introductory section, for example, the Czech National Bank (CNB) regularly provides technical assistance to other central banks targeting inflation, primarily in Central and Eastern Europe. Clearly, the extent of interaction is not influenced only by distance.[14] Other characteristics, such as a common monetary policy regime, also matter. To again use the example of the CNB, the CNB is more likely to provide technical assistance to more distant central banks such as the one in

[14] In this regard, Conley and Udry (2010) emphasize that the adoption of new technologies (or the adoption of policy experiments, as in our case) may be spatially and serially correlated, not necessarily due to learning but to some other omitted variable. These authors stress that the proper identification of social learning requires detailed data to control for otherwise confounding factors. Conley and Udry (2010) note that "*Spatial proximity is correlated with the presence of information links but it is not their sole determinant. Information links occur over long as well as short distances*".

Botswana because they both use inflation targeting as their monetary policy regime. Therefore, we present the results with two different weighting matrices, one based on a common monetary policy regime and the other based on geography. The comparison of the results based on these two different matrices is useful for various reasons. In addition, a matrix based on a common monetary policy regime may, in principle, solve the identification problem, which the matrix based on geography cannot. Nevertheless, identification issues should not be economically important for the geography weighting matrix, as Buera et al. (2011) propose. Therefore, we present the regression results for both types of matrices. We observe that the results are quite similar (see Table A.2), which leads us to believe that the identification issues are addressed sufficiently.

We present the regression results in Table A.3 with lagged peer effects and lagged explanatory variables. It may well be the case that peer effects take time and central banks react to their peers with a lag. In addition, the transparency scores may change because of some time-varying unobserved heterogeneity such as changes in educational background or analytical skills of the central bank staff. These results are available in Table A.4. The results in Table A.3 and A.4 support our baseline findings.

The results on the determinants of financial stability transparency are available in Tables A.5 and A.6 and indicate that domestic financial development and institutional quality determine the degree of transparency for the framework to support financial stability. Central banks in countries with a more stable institutional environment are more likely to display higher transparency. Furthermore, central banks in countries with developed financial markets place more emphasis on the transparent communication of their policies to safeguard financial stability. These results are broadly consistent with those of Horváth and Vaško (2016). The external environment of peers is important for domestic transparency. Finally, all our specifications indicate strong peer effects in financial stability transparency. This result suggests that central banks started publishing their financial stability reports and stress tests because their peers did so. Overall, our results suggest that central banks learn from each other's experiences.

We also present the results, where we additionally control for the institutional structure of financial sector supervision to examine the determinants of transparency in central banks' financial stability frameworks. Based on the data from Melecky and Podpiera (2013), we construct a variable capturing to what extent central bank is involved in the financial markets supervision. We assign

the value of one, if financial market supervision is fully under the umbrella of central bank. The value of 0.5 is assigned, if central bank supervises only banks. We assign the value of 0, if central bank is not involved in supervision. Controlling for the role central banks play in the supervision of financial markets is important because central banks may be more transparent in their framework to promote financial stability, if they have information and tools to combat financial crisis (Cukierman, 2009). These results are again largely in line with our baseline findings and are provided in Tables A.7 and A.8. Additionally, we find that central banks, which are involved in financial sector supervision, are more likely to be transparent.

Next, consistent with Ioannides and Zabel (2003), we also estimate our model using random effects instead of fixed effects. The results largely confirm our baseline findings presented in Table 1 and are available upon request.

Finally, we conduct Monte Carlo simulations to examine the bias of our estimator. Lee (2007) and Boucher et al. (2014) already conducted Monte Carlo simulations for the estimator we employ and found that the bias is rather small when they employ data similar to ours (in terms of the number of observations, the number of groups and the size of groups). Therefore, we conduct simulations, where we set the number of observations, the number of groups (R) and the size of group (m) to correspond exactly to our dataset and examine the size of bias for the different values of peer effects (λ).[15] Specifically, we consider the following values for λ between 0.05, 0.1, 0.15, ..., 0.85, 0.9 and 0.95. The results are available in Figure A.1 in the Appendix. We present the Monte Carlo simulations for the data undelying the regression results in Table 1 columns 1-4, the remaining simulations are available upon request. The diagonal line provides the true value; the dots represent the mean of corresponding simulated values for the peer effect coefficient. The simulated values closer to the diagonal line suggest smaller bias of our estimator. In general, we observe the simulated values to be close to the true values and the difference becomes negligible with the greater peer effect coefficient. Consider the left figure, where, for example, the true value of peer effect coefficient is 0.50, while the simulated values are 0.47 and 0.53, respectively (note that the corresponding standard error is approximately

[15]The procedure for Monte Carlo simulation is as follows: 1) model is estimated with actual data, 2) the coefficient estimates from the step 1 taken as the true parameters, peer effect coefficient is set to 0.05, 3) errors are randomly generated and the dependent variable calculated, 4) the coefficients are estimated with the dependent variable from step 3 and the estimates are saved, 5) steps 3 and 4 are repeated 1000 times. The peer effects parameters is then increased to 0.1, 0.15, ..., 0.95.

0.02). The exception is when the peer effect coefficient is small, e.g. 0.05 or 0.1, then, for some regression specifications, there is certain risk concluding that the peer effect is statistically insignificant even though it is present. But it should not be surprising that the estimator encounters more difficulties to show the existence of weak rather than strong peer effect.

5 Concluding Remarks

One of the largest changes that occurred in central banks over the last two decades was a movement toward greater transparency of their policies. A number of empirical studies have proposed that central banks became more transparent because of more stable domestic economic and institutional environments and that greater transparency was beneficial because it helped anchor inflation expectations and contributed to price stability. In this paper, we re-examine the literature on the determinants of transparency using not only a monetary policy transparency index but also a newly created financial stability assessment transparency index. We provide a novel explanation for why central banks became more transparent. Importantly, we ask whether central banks became more transparent directly because of the transparency of their peers.

To address this question, we estimate various panel social interaction econometric models to analyze the determinants of central bank transparency. We attempt to mimic previous empirical studies in terms of regression specifications as much as possible but extend them to explicitly account for peer and contextual effects. Controlling for a number of standard economic, financial, political, and institutional characteristics, we find that peer effects are present for decisions about transparency. In addition, the economic, financial, and institutional environments of central bank peers matter. In contrast, domestic characteristics, which have been proposed by previous literature as the primary cause of transparency, help explain transparency only to a certain extent.

Therefore, we believe that our results provide a richer perspective for understanding why central banks became transparent over the last two decades, and we highlight the need to pay more attention to an analysis of how central banks interact and learn from each other's experiences. In more general terms, our research provides unique evidence regarding the policy adoption of public institutions. Unlike previous literature, we identify the specific sources of these

policy adoptions to rule out the possibility that policy adoptions are correlated over time but are otherwise independent.

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Appendix

Data Definitions and Sources

Monetary policy transparency index: An index of monetary policy transparency taking values between 0 and 15. Dincer and Eichengreen (2014).

Financial stability transparency index: An index of financial stability transparency taking values between 0 and 15. Horváth and Vaško (2013).

GDP p.c.: GDP per capita in current USD. International Monetary Fund.

Past inflation: % change in the consumer price index. International Monetary Fund.

Openness: Exports of goods and services as a percentage of GDP. World Bank.

Financial depth: Private credit as a percentage of GDP. World Bank.

Rule of Law: Captures perceptions of the extent to which agents have confidence in and abide by the rules of society and, in particular, the quality of contract enforcement, property rights, the police, and the courts as well as the likelihood of crime and violence. Ranges from -2.5 (the lowest possible score) to 2.5 (the highest possible score). The Worldwide Governance Indicators - World Bank.

Voice and Accountability: Captures perceptions of the extent to which a country's citizens are able to participate in selecting their government as well as freedom of expression, freedom of association, and a free media. Ranges from -2.5 (the lowest possible score) to 2.5 (the highest possible score). The Worldwide Governance Indicators - World Bank.

Government efficiency: Captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Ranges from -2.5 (the lowest possible score) to 2.5 (the highest possible score) The Worldwide Governance Indicators - World Bank.

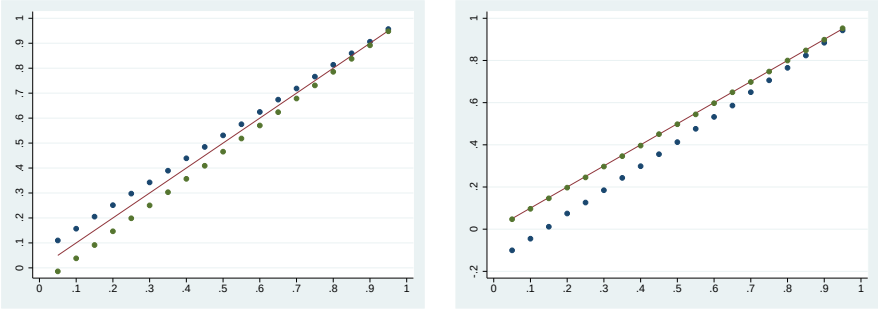
Political stability and the absence of violence: Measures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. Ranges from -2.5 (the lowest possible score) to 2.5 (the highest possible score). The Worldwide Governance Indicators - World Bank.

Democracy: Ordinal variable taking values from 0 to 10, measuring the level of democracy in the country by deliberating three main elements: 1. *"presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leaders"*, 2. *"the existence of institutionalized constraints on the exercise of power by the executive"*, 3. *"the guarantee of civil liberties to all citizens in their daily lives and in acts of political participation"*. Polity IV.

Autocracy: Ordinal variable taking values from 0 to 10 measuring the level of autocracy in the country, taking into account the essential attributes: *"chief executives are chosen in a regularized process of selection within the political elite, and once in office, they exercise power with few institutional constraints"*. Polity IV.

Overall polity score: The difference between the democratic score and the autocratic score. Ranges from +10 (for the most democratic countries) to -10 (for the most autocratic countries). Polity IV.

Figure A.1: **Monte Carlo Simulations: True vs. Simulated Values**



Note: The figures compare the simulated values to true values of the peer effect coefficient. The diagonal line pictures the true value; the dots represent the corresponding simulated values for the peer effect coefficient. The simulated values closer to the diagonal line suggest smaller bias of our estimator.

Table A.1: **The Determinants of Monetary Policy Transparency: Do Peer Effects Matter? W Based on the Most Common Monetary Policy Regime**

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Inflation	1.97	2.26	2.06	2.10	-4.72	-4.27**	-8.51*	-4.21**
	(2.16)	(2.19)	(2.18)	(2.18)	(2.13)	(1.89)	(1.90)	(1.90)
Openness	0.01	0.00	0.00	-0.00	-0.00	0.01**	0.01**	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
Financial depth	-0.00	0.03***	-0.00	0.03**	0.04***	0.04***	0.01	0.04***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)
GDP per capita	-0.00	-0.00	0.00***	0.00***	0.00**	0.00	0.00*	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rule of law	0.07							
	(0.21)							
Political stability		0.06						
		(0.13)						
Voice and acc.			0.18					
			(0.21)					
Government eff.				0.13				
				(0.19)				
Regulatory qu.					0.90***			
					(0.17)			
Democracy						0.04		
						(0.04)		
Autocracy							0.05	
							(0.04)	
Polity score								-0.00
								(0.02)
W*Inflation	-2.42	-2.59	-1.67	-3.19	2.33	-8.12*	-8.01*	-8.57*
	(4.53)	(4.66)	(4.70)	(4.57)	(4.47)	(4.83)	(4.83)	(4.82)
W*Openness	-0.01	0.01	0.01	0.01	0.01*	0.02	0.02	0.01**
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
W*Financial d.	0.03***	-0.00	0.04***	-0.00	0.00	0.01	0.05***	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
W*GDP p.c.	0.00***	0.00***	-0.00	-0.00	-0.00	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
W*Rule of law	3.88***							
	(1.09)							
W*Political stab.		-0.51						
		(0.65)						
W*Voice and acc.			1.25					
			(1.20)					
W*Gov. eff.				0.55				
				(1.02)				
W*Reg. quality					2.61***			
					(0.85)			
W*Democracy						0.19		
						(0.20)		
W*Autocracy							0.16	
							(0.23)	
W*Polity								0.03
								(0.11)
Peer effects (λ)	0.09	0.23**	0.22**	0.23**	0.06	0.42***	0.42***	0.42***
	(0.10)	(0.09)	(0.09)	(0.09)	(0.11)	(0.06)	(0.06)	(0.06)
Observations	711	711	711	711	711	770	770	770

Note: Standard errors are shown in parentheses; ***, ** and * denote statistical significance at the 1, 5 and 10 % level, respectively. W denotes the social network matrix based on the common monetary policy regime, which is set according to the most common regime in 2000-2010.

Table A.2: **The Determinants of Monetary Policy Transparency: Do Peer Effects Matter? W Based on the Geographical Distance**

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
CPI	1.67	-2.76	-2.35	1.95	-4.05	1.73	-4.42**	-4.63**
	(2.18)	(4.85)	(4.72)	(4.71)	(4.62)	(5.66)	(1.95)	(5.46)
Openness	0.01*	0.01	0.03*	0.01	0.01**	0.05**	0.05**	0.05**
	(0.00)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
Financial depth	-0.00	-0.00	0.06***	0.06***	0.06***	0.06***	0.06***	0.06***
	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.02)	(0.01)	(0.02)
GDP per capita	-0.00	0.00**	0.00**	-0.00	-0.00	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rule of law	-0.13							
	(0.21)							
Political stability		0.20						
		(0.13)						
Voice and acc.			0.16					
			(0.21)					
Government eff.				0.15				
				(0.19)				
Regulatory qu.					0.76***			
					(0.17)			
Democracy						0.05		
						(0.04)		
Autocracy							0.02	
							(0.04)	
Polity score								0.01
								(0.02)
W*CPI	-0.57	2.18	1.85	-2.83	2.12	-4.58**	-1.93	-0.41
	(4.74)	(2.20)	(2.19)	(2.19)	(2.14)	(1.93)	(5.31)	(1.94)
W*Openness	0.03	0.04**	0.01	0.04**	0.05**	0.02**	0.02**	0.01**
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
W*Financial d.	0.05***	0.06***	-0.00	-0.00	0.00	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)
W*GDP p.c.	0.00*	-0.00	-0.00	0.00**	0.00	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
W*Rule of law	2.75***							
	(1.038)							
W*Political stab.		-0.13						
		(0.76)						
W*Voice and acc.			-0.04					
			(1.01)					
W*Gov. eff.				0.85				
				(1.01)				
W*Reg. quality					2.87***			
					(0.91)			
W*Democracy						0.43		
						(0.27)		
W*Autocracy							-0.10	
							(0.22)	
W*Polity								0.15
								(0.13)
Peer effects (λ)	0.03	0.02	0.03	0.02	0.09	0.31***	0.32***	0.31***
	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.10)	(0.10)	(0.10)
Observations	711	711	711	711	711	770	770	770

Note: Standard errors are shown in parentheses; ***, ** and * denote statistical significance at the 1, 5 and 10 % level, respectively. W denotes the network matrix based on the inverse of distance.

Table A.3: **The Determinants of Monetary Policy Transparency: Do Peer Effects Matter? Lagged Regressors**

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Inflation	1.83	1.42	1.65	1.52	1.90	1.90	1.89	1.34
	(2.39)	(2.38)	(2.38)	(2.39)	(2.35)	(2.09)	(2.09)	(2.00)
Openness	0.01**	0.01**	0.01**	0.01**	0.01**	0.01***	0.01***	0.01**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.003)	(0.005)
Financial depth	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GDP per capita	0.00*	0.00	0.00*	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rule of law	0.14							
	(0.23)							
Political stability		-0.06						
		(0.14)						
Voice and acc.			0.12					
			(0.22)					
Government eff.				0.31				
				(0.21)				
Regulatory qu.					0.69***			
					(0.18)			
Democracy						0.08*		
						(0.04)		
Autocracy							-0.02	
							(0.04)	
Polity score								0.03
								(0.02)
W*Inflation	0.92	-0.31	-1.20	-1.40	0.27	0.34	0.50	0.33
	(4.63)	(4.67)	(4.53)	(4.54)	(0.19)	(4.71)	(4.73)	(4.75)
W*Openness	-0.01	0.01	0.01	0.01	0.01	0.02*	0.02	0.01
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
W*Financial d.	0.02	0.00	0.04	0.04	0.02*	0.03**	0.02*	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
W*GDP p.c.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
W*Rule of law	4.04**							
	(1.99)							
W*Political stab.		-0.53						
		(0.68)						
W*Voice and acc.			1.64					
			(1.05)					
W*Gov. eff.				0.43				
				(0.94)				
W*Reg. quality					1.45			
					(1.29)			
W*Democracy						0.66**		
						(0.29)		
W*Autocracy							0.41	
							(0.31)	
W*Polity								0.43***
								(0.17)
Peer effects (λ)	0.27*	0.57***	0.46***	0.48***	0.29*	0.30**	0.42***	0.28*
	(0.16)	(0.11)	(0.11)	(0.13)	(0.17)	(0.15)	(0.14)	(0.14)
Observations	725	725	725	725	725	725	725	725

Note: Standard errors are shown in parentheses; ***, ** and * denote statistical significance at the 1, 5 and 10 % level, respectively. W denotes the social network matrix based on the monetary policy regime as of 2000. All regressors lagged by one year.

Table A.4: **The Determinants of Monetary Policy Transparency: Do Peer Effects Matter? Time Effects**

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Inflation	0.65	0.66	0.29	0.87	1.36	0.06	0.11	0.01
	(2.31)	(2.32)	(2.31)	(2.37)	(2.26)	(2.29)	(2.31)	(2.30)
Openness	0.004	0.004	0.004	0.003	0.004	0.01	0.01	0.01**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.01)	(0.01)	(0.01)
Financial depth	0.006*	0.007*	0.006*	0.006*	0.006*	0.01**	0.01**	0.01**
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
GDP per capita	0.00**	0.00**	0.00**	0.00*	0.00	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rule of law	0.29							
	(0.20)							
Political stability		0.17						
		(0.12)						
Voice and acc.			0.65***					
			(0.19)					
Government eff.				0.49***				
				(0.18)				
Regulatory qu.					1.00***			
					(0.15)			
Democracy						0.14***		
						(0.04)		
Autocracy							-0.09**	
							(0.04)	
Polity score								0.07***
								(0.02)
W*Inflation	4.27	2.03	4.72	2.64	2.02	9.06*	5.98	9.05*
	(4.98)	(4.92)	(5.05)	(4.95)	(4.85)	(5.04)	(4.95)	(5.03)
W*Openness	-0.03**	-0.02*	-0.02	0.02*	-0.02	0.01	-0.01	0.01
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
W*Financial d.	0.01	0.03***	0.01	0.01	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
W*GDP p.c.	0.00	0.00**	0.00**	0.00**	0.00**	0.00***	0.00**	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
W*Rule of law	1.62**							
	(0.67)							
W*Political stab.		-0.04						
		(0.45)						
W*Voice and acc.			1.05*					
			(0.61)					
W*Gov. eff.				1.19*				
				(0.61)				
W*Reg. quality					1.45**			
					(0.61)			
W*Democracy						0.77***		
						(0.17)		
W*Autocracy							-1.17***	
							(0.24)	
W*Polity								0.56***
								(0.11)
Peer effects (λ)	0.36***	0.43***	0.38***	0.37***	0.30***	0.16*	0.19**	0.12
	(0.08)	(0.06)	(0.07)	(0.07)	(0.07)	(0.09)	(0.09)	(0.10)
Observations	729	729	729	729	729	720	720	720

Note: Standard errors are shown in parentheses; ***, ** and * denote statistical significance at the 1, 5 and 10 % level, respectively. W denotes the social network matrix based on the monetary policy regime as of 2000, while dependent and explanatory variables are from 2001-2010. Time effects included.

Table A.5: **The Determinants of Financial Stability Framework Transparency: Do Peer Effects Matter? W Based on the Most Common Monetary Policy Regime**

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Inflation	3.23	-5.08	3.07	-6.82	3.55	-4.92	-1.47	-5.69
	(2.91)	(2.95)	(2.92)	(2.86)	(6.86)	(6.29)	(6.16)	(6.17)
Openness	0.00	0.01	0.01	0.01	0.01	-0.00	-0.00	-0.02
	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Financial depth	0.01***	0.01***	0.05***	0.01***	0.01***	0.01***	0.03*	0.02*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GDP per capita	0.00	0.00	0.00	0.00	0.00	0.00**	0.00*	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rule of law	0.91***							
	(0.34)							
Political stability		-0.07						
		(0.18)						
Voice and acc.			-0.02					
			(0.29)					
Government eff.				1.67***				
				(0.27)				
Regulatory qu.					1.24***			
					(0.25)			
Democracy						0.04		
						(0.06)		
Autocracy							0.08	
							(0.05)	
Polity score								-0.01
								(0.03)
W*Inflation	-5.51	2.91	-4.21	3.71	-6.17	-2.06	-6.09	-1.87
	(6.93)	(6.99)	(6.96)	(6.82)	(2.88)	(2.44)	(2.46)	(2.45)
W*Openness	0.01	0.00	0.01	0.00	0.01	-0.02	-0.02	-0.00
	(0.03)	(0.03)	(0.01)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
W*Financial d.	0.04***	0.04***	0.01***	0.04**	0.04***	0.02*	0.01***	0.01***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)
W*GDP p.c.	0.00*	0.00*	0.00*	0.00*	0.00	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
W*Rule of law	-0.62							
	(1.46)							
W*Political stab.		-0.20						
		(0.77)						
W*Voice and acc.			2.91**					
			(1.30)					
W*Gov. eff.				0.59				
				(1.43)				
W*Reg. quality					0.64			
					(1.12)			
W*Democracy						0.12		
						(0.30)		
W*Autocracy							-0.03	
							(0.30)	
W*Polity								0.05
								(0.16)
Peer effects (λ)	0.19**	0.18**	0.14	0.18**	0.17*	0.16*	0.16*	0.16*
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)	(0.08)
Observations	880	880	880	880	880	900	900	900

Note: Standard errors are shown in parentheses; ***, ** and * denote statistical significance at the 1, 5 and 10 % level, respectively. W denotes the social network matrix based on the common monetary policy regime. Monetary policy regime is set according to the most common regime in 2000-2010.

Table A.6: **The Determinants of Financial Stability Framework Transparency: Do Peer Effects Matter? W Based on the Geographical Distance**

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
CPI	2.63	0.92	-0.99	-3.08	-3.17	3.28	2.10	1.79
	(2.89)	(2.91)	(7.31)	(7.10)	(2.86)	(7.62)	(2.43)	(7.35)
Openness	0.00	-0.02	-0.02	0.01	-0.01	0.00	-0.05**	0.00
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Financial depth	0.01**	0.01	0.02	0.04***	0.01***	0.01	0.01	0.01*
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)
GDP per capita	-0.00	-0.00	0.00***	0.00***	-0.00	-0.00	-0.00	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rule of law	0.83***							
	(0.30)							
Political stability		0.04						
		(0.18)						
Voice and acc.			-0.10					
			(0.29)					
Government eff.				1.75***				
				(0.26)				
Regulatory qu.					1.13***			
					(0.24)			
Democracy						0.06		
						(0.05)		
Autocracy							0.08	
							(0.05)	
Polity score								-0.01
								(0.03)
W*CPI	-0.53	2.56	2.46	2.87	2.94	-1.90	-0.99	-1.60
	(7.28)	(7.33)	(2.89)	(2.82)	(7.24)	(2.40)	(7.17)	(2.41)
W*Openness	-0.02	0.01	0.01	0.01	0.01	-0.05**	0.00	-0.05**
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
W*Financial d.	0.02	0.01**	0.01**	0.01***	0.02*	0.01**	0.01*	0.01
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
W*GDP p.c.	0.00***	0.00***	-0.00	0.00	0.00**	0.00***	0.00***	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
W*Rule of law	1.53							
	(1.53)							
W*Political stab.		2.15**						
		(0.95)						
W*Voice and acc.			0.09					
			(1.28)					
W*Gov. eff.				4.24***				
				(1.45)				
W*Reg. quality					2.01			
					(1.38)			
W*Democracy						-0.11		
						(0.33)		
W*Autocracy							0.39	
							(0.27)	
W*Polity								-0.15
								(0.16)
Peer effects (λ)	0.31***	0.27**	0.33***	0.06	0.27**	0.31***	0.34***	0.34***
	(0.11)	(0.11)	(0.11)	(0.13)	(0.11)	(0.10)	(0.10)	(0.10)
Observations	880	880	880	880	880	900	900	900

Note: Standard errors are shown in parentheses; ***, ** and * denote statistical significance at the 1, 5 and 10 % level, respectively. W denotes the network matrix based on the inverse of distance.

Table A.7: **The Determinants of Financial Stability Framework Transparency: Do Peer Effects Matter? W Based on the Most Common Monetary Policy Regime and Controlling for Supervisory Structure**

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
CPI	8.70**	8.39*	8.08*	-11.17	8.44**	-10.02	-4.22	-4.32
	(4.27)	(4.29)	(8.71)	(8.61)	(8.63)	(7.8á5)	(3.80)	(3.78)
Openness	-0.00	-0.00	-0.00	-0.00	0.01	0.01	-0.01	-0.00
	(0.01)	(0.001)	(0.03)	(0.03)	(0.01)	(0.03)	(0.01)	(0.03)
Financial depth	0.00	0.04***	0.04***	0.00	0.03***	0.04***	-0.00	0.04***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
GDP per capita	0.00	0.00	0.00**	0.00**	0.00	0.00***	0.00**	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Supervisor. struct.	1.13**	1.00*	1.05*	1.29**	1.11**	0.40	0.41	0.37
	(0.56)	(0.56)	(4.91)	(0.55)	(3.90)	(0.48)	(0.47)	(2.37)
Rule of law	0.77*							
	(0.44)							
Political stability		-0.12						
		(0.23)						
Voice and acc.			0.69					
			(0.44)					
Government eff.				1.76***				
				(0.35)				
Regulatory qu.					1.30***			
					(0.36)			
Democracy						0.15*		
						(0.08)		
Autocracy							-0.04	
							(0.11)	
Polity score								0.07
								(0.05)
W*CPI	-9.89	-8.70	-9.25	8.34**	-8.75	-3.91	-9.45	-9.91
	(8.70)	(8.78)	(4.27)	(4.19)	(4.23)	(3.77)	(7.83)	(7.84)
W*Openness	0.01	0.02	0.01	0.01	0.00	-0.01	-0.01	-0.01
	(0.03)	(0.03)	(0.01)	(0.01)	(0.03)	(0.01)	(0.03)	(0.01)
W*Financial d.	0.03**	0.00	0.00	0.03***	0.00	-0.00	0.03**	-0.00
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
W*GDP p.c.	0.00**	0.00*	0.00	0.00	0.00	0.00**	0.00***	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
W*Supervisor. str.	1.62	-0.20	0.36	1.49	2.08	-0.43	1.47	-0.17
	(4.24)	(3.92)	(0.57)	(4.14)	(0.55)	(2.41)	(2.36)	(0.48)
W*Rule of law	2.63							
	(2.37)							
W*Political stab.		-0.62						
		(0.88)						
W*Voice and acc.			0.15					
			(1.86)					
W*Gov. eff.				0.67				
				(1.58)				
W*Reg. quality					4.66**			
					(1.94)			
W*Democracy						1.01**		
						(0.41)		
W*Autocracy							2.99***	
							(0.68)	
W*Polity								1.00***
								(0.28)
Peer effects (λ)	0.27***	0.28***	0.28***	0.27***	0.21**	0.19**	0.08	0.14
	(0.08)	(0.08)	(0.08)	(0.08)	(0.09)	(0.08)	(0.09)	(0.09)
Observations	621	621	621	621	621	693	693	693

Note: Standard errors are shown in parentheses; ***, ** and * denote statistical significance at the 1, 5 and 10 % level, respectively. W denotes the social network matrix based on the common monetary policy regime. Controlling for the institutional framework of financial supervision.

Table A.8: **The Determinants of Financial Stability Framework Transparency: Do Peer Effects Matter? W Based on Geography and Controlling for Supervisory Structure**

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
CPI	7.59*	7.61*	7.10*	7.22*	5.51	25.98**	22.52**	-6.66*
	(4.23)	(10.01)	(9.98)	(4.12)	(4.19)	(3.62)	(9.70)	(3.65)
Openness	-0.01	0.01	-0.01	-0.01	-0.00	-0.01	-0.02	-0.01
	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)
Financial depth	-0.00	0.03**	-0.00	0.00	0.00	-0.00	0.01	0.01
	(0.00)	(0.02)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
GDP per capita	-0.00	0.00**	0.00**	-0.00	0.00	0.00***	0.00***	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Supervisor. struct.	0.92*	0.96*	0.87	1.05**	0.79	-7.19**	-6.27**	-6.73**
	(0.54)	(4.14)	(0.54)	(0.53)	(0.54)	(0.46)	(0.47)	(0.46)
Rule of law	0.59							
	(0.43)							
Political stability		0.07						
		(0.23)						
Voice and acc.			0.74*					
			(0.43)					
Government eff.				1.91***				
				(0.35)				
Regulatory qu.					1.21***			
					(0.36)			
Democracy						0.23***		
						(0.07)		
Autocracy							-0.17	
							(0.11)	
Polity score								0.13***
								(0.05)
W*CPI	5.29	6.40	5.60	5.09	7.53*	-6.21*	-6.37*	24.13**
	(9.97)	(4.22)	(4.23)	(9.753)	(9.89)	(10.09)	(3.68)	(9.94)
W*Openness	0.04	-0.01	0.02*	0.02*	0.02*	-0.01	-0.01	-0.01
	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
W*Financial d.	0.03**	-0.00	0.03**	0.05***	0.04**	0.01	-0.00	-0.00
	(0.01)	(0.00)	(0.016)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)
W*GDP p.c.	0.00*	-0.00	-0.000	0.00**	-0.00	-0.00	-0.00	0.00***
	(0.00)	(0.00)	(0.000)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
W*Supervisor. str.	-5.12	-4.69	-7.44*	-7.66**	-9.23**	0.34	0.20	0.29
	(4.07)	(0.54)	(3.98)	(3.86)	(3.89)	(3.02)	(3.02)	(3.01)
W*Rule of law	3.46							
	(2.30)							
W*Political stab.		-1.70*						
		(1.00)						
W*Voice and acc.			-1.10					
			(1.67)					
W*Gov. eff.				2.51				
				(1.70)				
W*Reg. quality					2.65			
					(1.83)			
W*Democracy						0.16		
						(0.54)		
W*Autocracy							0.67	
							(0.97)	
W*Polity								-0.06
								(0.39)
Peer effects (λ)	0.27**	0.27**	0.31**	0.06	0.19	0.28***	0.32***	0.30***
	(0.13)	(0.13)	(0.12)	(0.15)	(0.14)	(0.10)	(0.10)	(0.10)
Observations	630	630	630	630	630	693	693	693

Note: Standard errors are shown in parentheses; ***, ** and * denote statistical significance at the 1, 5 and 10 % level, respectively. W denotes the network matrix based on the inverse of distance. Controlling for the institutional framework of financial supervision.

Table A.9: **The Determinants of Monetary Policy Transparency: Do Peer Effects Matter? W Randomly Generated**

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
CPI	2.07	2.25	-2.70	2.04	-3.74	2.87	-1.91	-2.15
	(2.13)	(2.17)	(4.62)	(4.58)	(2.12)	(2.08)	(2.09)	(5.10)
Openness	0.01*	0.01	0.01	0.01	0.01*	0.03	0.03	0.01*
	(0.00)	(0.00)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
Financial depth	0.00	0.04***	0.04***	0.00	0.04***	0.04***	0.04**	0.00
	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
GDP per capita	0.00	0.00***	0.00***	0.00***	0.00***	0.00	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Rule of law	0.030							
	(0.21)							
Political stability		0.13						
		(0.13)						
Voice and acc.			0.13					
			(0.21)					
Government eff.				0.15				
				(0.191)				
Regulatory qu.					0.84***			
					(0.17)			
Democracy						0.04		
						(0.04)		
Autocracy							0.01	
							(0.04)	
Polity score								0.01
								(0.02)
W*CPI	-1.30	-4.14	2.08	-4.00	2.23	-2.29	2.640	2.818
	(4.58)	(4.60)	(2.16)	(2.16)	(4.51)	(5.10)	(5.095)	(2.089)
W*Openness	0.02	0.02	0.01	0.02	0.01	0.01*	0.010**	0.029
	(0.02)	(0.02)	(0.00)	(0.00)	(0.0)	(0.01)	(0.005)	(0.005)
W*Financial d.	0.05***	0.00	0.00	0.05***	0.00	0.00	0.003	0.04***
	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.014)	(0.014)
W*GDP p.c.	0.00***	0.00	0.00	0.00	0.00	0.00***	0.00	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.000)
W*Rule of law	4.71***							
	(1.08)							
W*Political stab.		-0.46						
		(0.68)						
W*Voice and acc.			1.49**					
			(0.69)					
W*Gov. eff.				2.32**				
				(0.94)				
W*Reg. quality					2.25***			
					(0.86)			
W*Democracy						0.15		
						(0.12)		
W*Autocracy							-0.35**	
							(0.18)	
W*Polity								0.12
								(0.07)
Peer effects (λ)	-0.32**	-0.05	-0.13	-0.14	-0.21	0.01	0.01	0.01
	(0.15)	(0.12)	(0.13)	(0.13)	(0.14)	(0.11)	(0.11)	(0.11)
Observations	729	729	729	729	729	720	720	720

Note: Standard errors are shown in parentheses; ***, ** and * denote statistical significance at the 1, 5 and 10 % level, respectively. W is randomly generated. As a result, peer effects should not be statistically significant.