

Social Trust and Central-Bank Independence^{*}

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Abstract. Central banks have been made more independent in many countries. A common rationale has been the existence of a credibility (or lack-of-trust) problem for monetary policy. This indicates a possible link between social trust, as measured by the share of people who think that most people can be trusted, and central-bank independence. On the one hand, social trust could facilitate consensus and make central-bank reforms in the presence of a credibility problem more probable, suggesting a positive relationship. On the other hand, social trust could mitigate the credibility problem itself, in which case the relationship would be negative. Our empirical findings, based on data from 149 countries, indicate that higher trust is associated with a less independent central bank in emerging and developing countries. One possible interpretation is that high-trusting countries in this group can credibly pursue a low-inflation goal without making the central bank very independent. In contrast, trust does not seem related to the central-bank independence of developed countries.

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1. Introduction

Social trust – as measured by the share of people who think that most people can be trusted – seems conducive to the reaching of quite a few social and economic goals. For example, it is positively related to economic growth (Knack and Keefer, 1997; Zak and Knack, 2001; Berggren et al., 2008), trade (den Butter and Mosch, 2003; Guiso et al., 2009), the size of the stock market (Guiso et al., 2008), the welfare state (Bergh and Bjørnskov, 2011), financial integration (Ekinci et al., 2007), subjective well-being (Helliwell, 2006; Helliwell and Wang, 2010), education (Bjørnskov, 2009; Papagapitos and Riley, 2009), governance (Knack, 2002; Bjørnskov, 2010), democratic stability (Uslaner, 2003) and health (Rose, 2000). Societies in which people think that most people can be trusted thus tend to exhibit many widely valued qualities that are lacking in low-trust societies.

We propose to study another possible effect of trust, viz., whether it is related to central-bank independence. Pinpointing the determinants of this kind of independence is of interest, since previous studies have generally found it to entail low inflation rates – see, e.g., Berger et al. (2001), Acemoglu et al. (2008), Crowe and Meade (2008) and Cukierman (2008) – which is a generally embraced policy goal. Our hypothesis is that social trust is a factor of importance – in fact, there is a natural connection between the rationale behind making central banks more independent and trust, in that the quest to give central banks an independent role largely builds on a perceived credibility (or lack-of-trust) problem. According to the literature on time-inconsistency in monetary policy, starting with Kydland and Prescott (1977) and Barro and Gordon (1983), policymakers have an incentive to renege on their pronounced inflation goals through surprise inflation, which causes the public to eventually not trust announcements of such goals. The equilibrium outcome is the inflation rate at which no further gains can be obtained through inflation surprises. This situation entails inefficiently high inflation with no reduction in unemployment. Rogoff's (1985) solution involves the delegation of monetary policymaking to a conservative central banker, that is, one that puts a lower weight on the loss associated with unemployment than policymakers, resulting in lower inflation in equilibrium. Despite this connection, no previous study has to our knowledge analyzed the relationship between social trust and central-bank independence.

It bears noting that we study social and not particularized trust.¹ The difference between these two kinds of trust is that the former is unrelated to information about specific persons or organizations – it captures a basic outlook on people in general – while the latter refers to trust in people or organizations one knows or knows something about. Our primary motivation for looking at social trust is that we theorize that central-bank independence is a function of trust towards “everybody”, since a decision to delegate power arguably depends on an assessment, by those undertaking the delegating, of the reactions of very broad groups of unidentified actors, such as politicians, voters and civil servants. Only social trust, we argue, fully captures this broad, trusting outlook that is related to a willingness to undertake reform.²

¹ Social trust is also referred to as interpersonal, generalized, moralistic or anonymous trust, while particularized trust is also referred to as specific or strategic trust. On conceptual issues in the trust literature, see Hooghe and Stolle (2003), Bjørnskov (2007) and Naef and Schupp (2009).

² An alternative approach would be to study the effects on central-bank independence of the (particularized) trust of voters in the central bank. While this could be a valuable topic for future research, we note that this would capture a much more narrow aspect of trust.

We argue that the relationship is theoretically ambiguous in terms of its sign: it could be either positive or negative. On the one hand, social trust could make higher central-bank independence more probable, since it entails lower transaction costs of political agreement. Hence, if a problem has been identified – such as in the literature on the time-inconsistency of monetary policy – then proposed solutions, such as making the central bank more independent, could more easily be adopted. For example, it cannot only be expected to be the case, in a setting with high social trust, that politicians trust each other but also that they trust independent central bankers.

On the other hand, in a setting with high social trust, the identified problem in the form of time-inconsistency could be smaller, since the credibility of the political decision-makers is high to begin with. In this sense, trust can be seen as an informal institution which serves as a substitute for a credible formal institution. The time-inconsistency problem may hence be negligible if people in general (which may include politicians and central bankers) are trusting, and consequently the need to follow Rogoff (1985) and implement central-bank independence reforms may be (thought to be) superfluous.

As theory does not yield an unequivocal predication about the sign of the relationship, this must be settled empirically. We do so by making use of Arnone's et al. (2007) central-bank independence indices, in order to measure our dependent variable. Social trust is defined as the share of the population that answers "yes" to the first part of the question "In general, do you think most people can be trusted or can't you be too careful?", as measured by the average of all available and credible observations in the five waves of the World Values Survey and some complementary sources. Previous studies of the determinants of central-bank independence – e.g., de Haan and Van't Hag (1995), Cukierman and Webb (1995), de Haan and Siermann (1996), Bagherei and Habib (1998), Hayo and Hefeker (2002) and Carmignani et al. (2008) – do not, as far as we know, include social trust as an explanatory variable when trying to explain how much power politicians have delegated to central bankers.

This study most closely relates to Hayo and Voigt (2008), who look at the effects of *de facto* judicial independence and trust in the legal system on central bank independence and inflation rates. They find that both factors are positively related to independence and negatively related to inflation rates. The idea is that there is a second-order commitment problem (Moser, 1999), such that politicians may have an incentive to influence monetary policy by trying to intervene in the work of the independent central bank, and that an independent and trusted legal system may make such attempts difficult to undertake. Note that the trust measure, and the suggested mechanism for why this kind of trust matters, is different compared to the one used in this study, social trust. We also use another outcome variable: instead of looking at turnover rates of central-bank governors, which arguably is an imprecise measure of central-bank independence³, we use central-bank independence indices described in more detail in Section 3.

³ The underlying assumption is that the central bank is not independent if central bank governors are frequently replaced. However, the turnover rate for a central-bank governor might also be low because the governor is acting on direct orders from the government. In fact, one could argue that truly dependent central banks will be characterized by very low turnover rates, as the government does not have any reason to replace their governors. Furthermore, it could also be that governors are often replaced for other reasons than being at odds with the government, such as being offered new jobs elsewhere.

Our results indicate that social trust is negatively related to central-bank independence in emerging and developing countries. This suggests that low-trusting societies tend to delegate more power from politicians to independent central bankers and that high-trusting countries can pursue a low-inflation goal without making the central bank independent from the government. Thus, the institutional framework in this area seems to be affected by the level of social trust, at least in economies that have not yet reached a high degree of development. In developed countries, the results indicate that social trust is not really very important for the level of central-bank independence, but that the relationship if anything is positive. The non-importance may result from there being established forms for cooperation and for achieving reforms that make trust somewhat redundant, or that there are formal institutions already in place that facilitate consensus and reforms.

We next introduce some theoretical preliminaries, before describing the data and empirical method. After presenting the results, we offer some concluding remarks.

2. Trust and Central-Bank Independence: Some Theoretical Preliminaries

We argue that, on theoretical grounds, it is possible either with a positive or a negative effect of social trust on the level of central-bank independence, where this level at any point in time is a function of past institutional reforms. A positive effect can be expected when trust helps politicians undertake collective action to solve a problem that affects people with different backgrounds, knowledge, affiliations and interests. A negative effect can be expected when trust *itself* removes a problem of this kind, such that there is no need for collective action to solve it.

2.1. A Positive Effect

In order for mutually beneficial agreements to come about, actors generally need some assurance that they will not be exploited by opportunists and that the agreements are reliable. In simple and standardized transactions, this is not a big problem, but as soon as more people are involved, when the social distance between them is large, when consequences are uncertain, when monitoring is difficult, when there is a temporal feature to the agreement and when the object of the transaction is complex, some method of assurance increases the probability of agreement. As explained by Knack and Keefer (1997), this can come about through written contracts, aided by formal legal institutions, but they note that this is a costly and imperfect method. An alternative mechanism, which reduces the need for contracts and formal institutions for agreements to come about, is provided by trust.

This reasoning can also be applied to political decision-making. When reforms are contemplated, there are many obstacles to overcome. Politicians may need assurance that other politicians will not undermine their decisions later on; they may need assurance that bureaucrats will co-operate and not shirk or work for a different agenda; they may need assurance that voters will not quickly withdraw their support as a result of the reforms; and they may need assurance that interest groups will not spend large resources to block or undo the reforms. Such assurance can to some extent come from credible formal institutions, such as a division of power with a strong and independent legal system acting as a check on legislation (Hayo and Voigt, 2008) or, differently put, with the existence of multiple veto players (Keefer and Stasavage, 2003). But as in the case of

economic transactions, formal institutions are costly and imperfect, and trust can provide an alternative mechanism through which politicians can obtain assurance of the kinds just mentioned, making them more inclined to undertake reforms.

More specifically, *if politicians trust each other*, both within and between party groups, agreement on reform will be easier (Boix and Posner, 1998; Knack, 2002).⁴ Interests are more easily aligned, and gridlock less probable, when political actors do not perceive other such actors to be opportunistic and when they believe that agreements will be adhered to. Two cases illustrate this point. Den Butter and Mosch (2003) find that trust among policymakers and among other key actors on the political scene in the Netherlands greatly facilitated the implementation of reforms that contributed to a strong economic development. Bergh and Erlingsson (2009) likewise find that a key explanation for important policy reforms in Sweden, such as a major pension reform and economic liberalization, was the result of a pragmatic consensus orientation that may be rooted in trust.

Second, *if politicians trust bureaucrats*, this means that they are more prone to delegate power. A major reason for this is that trust arguably mitigates the principal-agent problem; another is that it fosters a sense of co-operation (Boix and Posner, 1998). According to the findings of Bjørnskov (2009), the expectation that public officials are more honest and therefore more trustworthy in societies with high trust receives empirical support.

Third, *if politicians trust voters*, this implies that voters are perceived to assess politicians in a generous and long-term manner, which may facilitate reforms that are socially beneficial in the longer run albeit possibly costly for some during a period of transition. If compensation is promised to cover temporary losses, trust increases the credibility of such a promise, which should reduce resistance to reforms (Heinemann and Tanz, 2008). Reformers are then less worried about immediate electoral punishment. Furthermore, if voters are trustworthy in this way, this also implies that interest-group activity can be expected to be lower. Instead of forming polarizing groups, people are to a larger degree characterized by community-oriented and co-operative sentiments and by taking the interests of people in general into account (Boix and Posner, 1998).⁵ As a result, the costs of securing agreement can be expected to be lower and the sustainability of reforms to be higher. This in turn increases the propensity to undertake reforms.

This reasoning can be readily applied to level of central-bank independence and the reforms that precede and determine it. Initially, there are some politicians who consider a reform desirable, perhaps because they think it will help bring about lower inflation. The logic of this idea is that due to the time-inconsistency problem identified by Kydland and Prescott (1977) and Barro and Gordon (1983), it can be beneficial to insulate monetary policy-making from the incentives of politicians by delegating that authority to a central bank with a specified (more or less flexible) goal (Rogoff, 1985).

⁴ Inglehart (1999) argues, along lines such as these, that trust is also beneficial for democratic stability, since political actors are less prone to abide by constitutional rules if they do not expect, in a trusting manner, others to do so as well.

⁵ As Knight (1992: 214) sees it, "institutional development and change are products of an ongoing bargaining game among differing groups", and the presence of trust reasonably changes this game in a fundamental sense. Cf. Hall and Thelen (2009), who stress that institutional reform originates in political compromise which has to overcome distributional conflict. Compromise and taking a social perspective is more probable in the presence of trust.

As Neumann (1991) and Hayo and Voigt (2008) clarify, for such a reform to be credible, independence needs to be built on a certain institutional structure that guarantees the absence of meddling from the politicians. However, McCallum (1997) and Hayo and Voigt (2008) also point out that there is a second-order commitment problem, such that politicians may still have an incentive to intervene in the *formally* but not necessarily *actually* independent central bank, e.g., by changing its goals or constitutional status and by replacing governors or affecting their working conditions. While they find that *de facto* judicial independence coupled with the public's trust in legal institutions seem to solve large parts of this problem, we propose that social trust offers an alternative solution to the problem. If trust is present, credibility can be established more easily in a given institutional setting.

To see how, let us now return to the politicians who contemplate a central-bank independence reform. For the reasons outlined above, we suggest that trust may be positively related to the chance for reform and the ensuing level of central bank independence: by making enduring agreement between politicians easier, by politicians having confidence in independent central bankers, by politicians believing that voters will tend to believe that the reform is undertaken in order to increase chances for better overall economic outcomes and by politicians not seeing a risk for serious interest-group activity aiming to undermine reform attempts.

To this, we can now add two specific features of reforms that increase central-bank independence. First, politicians have reason, in a high-trust society, to expect such a reform to be perceived as credible, even when considering the second-order commitment problem, which makes the expected welfare benefits of an independent central bank, in terms of lower inflation, higher.⁶ This in itself can make a reform more probable. Second, some have argued that there is a problem in having a central bank which is not directly accountable to voters (and only weakly to elected politicians).⁷ But as people in a high-trust society probably have an easier time accepting an independent decision-making body, as they regard central-bank decision-makers as trustworthy, this makes the accountability problem less severe and also, in political discourse, the arguments against independence weaker and hence a reform more probable.

2.2. A Negative Effect

While there are reasons to expect social trust to facilitate reforms that increase central-bank independence, there are also at least two reasons to expect the influence to go in the other direction.

First, the reasoning in section 2.1 proceeded on the assumption that there was an initial problem, the solution of which required some type of reform. It was then argued that trust helped make successful implementation of a reform, deemed to proffer a solution to the initial problem, more probable. This pointed to a positive relationship between trust and the ensuing level of central-bank independence. However, trust could contribute not only to increasing central-bank independence *given a problem*, but it could also affect the scope of, or even the existence of, the problem. That is, trust may mitigate or eliminate *the problem itself*, and if so, the need for reform should be decreasing in the level of trust. This is not an implausible argument in the case of monetary

⁶ Knack and Keefer (1997: 1253): "Promises by central bankers that they will not raise interest rates ... are ... likely to be more credible in societies where people trust each other more."

⁷ See, e.g., Eijffinger and Hoeberichts (2002).

policy. Trust can be expected to reduce the problem of time-inconsistency: if there is mutual trust between politicians and voters, the latter do not expect the former to renege on their stated commitments, and the former – in striving to continue to be perceived as trustworthy – will hesitate to increase inflation surprisingly. Similarly, if politicians trust each other, there is less suspicion that opposing parties will default on their promises in this area in the future. There is thus a “social discipline” on monetary policy which makes central-bank independence superfluous for achieving credibility for a low-inflation approach.⁸

Second, Butler et al. (2009) make the point that there can be too much trust, in the sense that one can become gullible and exploited if one does not take a critical stance toward the motives of others. They show that individual economic performance is positively related to an intermediate level of trust (too little makes one forego opportunities). This point may be valid also for our analysis. Even if the trust level is high in a country, one should not regard this as a perfect society in which no opportunists exist. The Scandinavian countries have the highest trust levels, around the mid-60s, which means that about one third of their populations do not think that most people can be trusted – and they may act accordingly. A naïvely trusting person may hence be exploited by some people. The same thing could hold in the realm of monetary policy. If the trust level in the population is high, it could be that some politicians wish to preserve the option to surprise the citizens with inflation and hence refrain from making the central bank independent. After all, a trusting people are perfect to exploit in the time-inconsistent manner, since they do not at all suspect that there is a monetary surprise lurking ahead. This could constitute a second reason for why social trust is negatively related to central-bank independence.

After this theoretical analysis, with an ambiguous sign of the effect, we now turn to the empirical analysis, to see whether and how trust is related to central-bank independence.

3. Data

3.1. Dependent Variable

To measure central-bank independence, our dependent variable, we make use of the index of Arnone et al. (2007). They apply the methodology of Grilli et al. (1991) to calculate a new index measuring central-bank independence for 163 central banks in 2003. Central-bank independence indices used by Alesina (1988), Grilli et al. (1991), Cukierman et al. (1992), Alesina and Summers (1993), and Eijffinger et al. (1998) are all based on data from the late 1980s, which means that they do not reflect the world-wide increase in central-bank independence that started in the 1990s.

The Arnone et al. (2007) index distinguishes between the political and economic independence of the central bank. The former refers to the ability of central banks to choose the final goal of monetary policy, i.e., set its own monetary-policy objectives. Economic independence refers to the

⁸ Admittedly, if trust merely reduces but does not eliminate the problem, trust could *both* make the problem smaller and the probability of a reform greater, although one would expect a reform to be less far-reaching in independence the smaller trust makes the initial problem. In this case, a small but positive relationship between trust and central-bank independence would still obtain.

ability of the central bank to independently choose monetary-policy instruments to reach its exogenously defined objectives.

Political independence of the central bank is based on eight criteria, taking the value one (and zero otherwise) in each case if: (P1) the central bank governor is appointed without government involvement; (P2) the central bank governor is appointed for more than 5 years; (P3) all of the members in the central bank governing board are appointed without government involvement; (P4) the board members are appointed for more than five years; (P5) there is mandatory participation of government representatives on the board; (P6) no government approval is required for formulation of monetary policy; (P7) the central bank is legally obliged to pursue monetary stability as one of its objectives; and (P8) there are legal provisions that strengthen the central bank's position in the event of a conflict with the government.

Economic independence of the central bank is based on the following criteria, taking the value one (and zero otherwise) in each case if: (E1) the government cannot obtain direct credit from the central bank; (E2) when credits are available they are extended to the government at market interest rates; (E3) credit to the government is temporary; (E4) credit given to government is for a limited amount; (E5) the central bank does not participate in the primary market for public debt; (E6) the central bank is responsible for setting the policy rate; and (E7) the central bank has no responsibility for overseeing the banking sector (two points) or shares such responsibility (one point).

The scores on these indices are summarized, and standardized scores for each sub-index, as well as for the sum of the two indices, are then calculated. Thus, our dependent variable, *central-bank independence (CBI)*, is measured in terms of an index that ranges between zero (low independence) and one (high independence). We present results for the full index as well as the two sub-indices in order to analyze whether social trust affects the political or economic independence of the central banks differently.⁹

Merging the data for the Arnone et al. (2007) indices with country background data renders a sample covering 149 countries for which the level of central-bank independence is known at the end of 2003 (CBI_{03}). Table 1 shows descriptive statistics regarding the level of central-bank independence for both the full sample and three sub-samples (advanced, emerging and developing countries).¹⁰ For comparison, we include data for the central-bank independence of 73 countries in 1989 (CBI_{89}).

[Table 1 near here]

Table 1 shows that the level of central-bank independence has increased dramatically around the world, confirming Cukierman's (2008: 723) statement that "most central banks in today's world

⁹ CBI indices are the most common way of measuring how independent central banks are from politicians. However, the construction of CBI indices is also somewhat subjective, potentially leading to bias (Forder, 1996, 1998; Mangano, 1998).

¹⁰ Countries are classified into advanced, emerging and developing countries using the classification scheme used by Arnone et al. (2007) in Table 11 on pp. 48–49.

enjoy substantially higher levels of both legal and actual independence than twenty years ago or earlier.” This interpretation of policy development is also supported by Daunfeldt et al. (2009), who find that 89 of 132 studied countries had implemented institutional reforms that formally established the independence of central banks from elected policymakers during the period 1980–2005.

3.2. Explanatory Variables

Our main explanatory variable is social trust, defined as the share of the population that answers “yes” to the first part of the question: “In general, do you think most people can be trusted or can’t you be too careful?” This question is correlated with measures of honest behavior (Knack and Keefer, 1997; Bjørnskov, 2007); the share of people who do not reply to it is very low, typically below 5 percent, which indicates that people grasp it clearly (Nannestad, 2008); both in-depth interviews (Uslaner, 2002) and the fact that replies to the question predict outcomes of trust experiments reasonably well when the stakes of anonymized games are of economic significance, suggest that the question measures trust in strangers or people whom the respondents do not know (Sapienza et al., 2007; Ostrom et al., 2009; Thöni et al., 2009). Following Bjørnskov (2007), we use the average of all available and credible observations in the five waves of the World Values Survey, supplemented by data from the LatinoBarómetro, the AfroBarometer, the Asian and East Asia Barometers, and the Danish Social Capital Project. All of these surveys have asked the same trust question.¹¹ This variable is quite stable over time, and by making use of averages of several data points we reduce the risk of having atypical data of individual years in our dataset.

In addition, we use a set of economic and political control variables, based on previous studies that have looked at the determinants of central-bank independence; see Daunfeldt et al. (2009). Economic characteristics included in the empirical analysis are the level of inflation, measured by the annualized percentage change in consumer prices from *IMF Financial Statistics*; unemployment, obtained from the *International Labor Organization* (ILO); gross domestic product (GDP) per capita in US dollars and the use of fund and credits from the International Monetary Fund, both from the World Bank’s *World Development Indicators*.

The motivation for including inflation is that countries that are characterized by high inflation could be more prone to implement central-bank independence reforms than countries with low inflation. On the other hand, low values might be an effect of an historical high level of central-bank independence, suggesting that there might be a reverse-causality problem. As for unemployment, the time-inconsistency model of monetary policy implies that the benefit of surprise inflation is higher the larger the gap between the desired unemployment rate and the natural rate of unemployment. Hence, to the extent that low inflation is valued highly, countries with high unemployment could have a larger incentive to increase the level of central-bank independence (Cukierman, 1994). GDP per capita is a standard variable to differentiate between countries on the basis of wealth, but it is unclear what the sign of a possible effect is. As for IMF credits, it has been suggested that reforms to increase central-bank independence have been implemented, especially in less-developed countries, to signal creditworthiness to foreign investors (Maxfield, 1997). We therefore expect this measure to be positively related to the level of central-bank independence, at least in countries with weak financial credibility.

¹¹ We consider the Iranian and Chinese World Values Survey data, as well as the Canadian 2000 trust value in the World Values Survey, as unreliable and exclude them (Uslaner, 2002; Bjørnskov, 2007).

Political factors used in the analysis are political fragmentation in the parliament and whether the country is a federation or not, both from Lundell and Karvonen's (2003) *Comparative Data Set on Political Institutions*, as well as the number of coups in previous periods from the *Coup Data Codebook* (Marshall and Marshall, 2007). Political fragmentation is measured using Rae's index of party fractionalization in the parliament. A value of zero indicates that one party has all seats in parliament, whereas a value of 10,000 indicates that each party has only one seat. Political fragmentation has a theoretically ambiguous effect: fragmentation makes it more difficult to agree on making the central bank more independent, but it also makes the politicians more motivated to tie the hands of the opposition when those in power alternate. The federation dummy takes the value one if the country can be classified as a federation, and zero otherwise. It is a measure of institutional checks and balances, which could be expected to affect the level of central-bank independence, as central banks in such countries tend to be more independent to begin with (Moser, 1999). Finally, the number of coups in previous periods is included as a measure of political instability. It is proxied with an exponential weighted moving average (EWMA, 20 years) of the number of coups in the country. The weights for successive past observations in the moving average are calculated as $(1-\lambda)\lambda^0, (1-\lambda)\lambda^1, (1-\lambda)\lambda^2, \dots$, where λ is 0.75.¹² Political instability is included as an explanatory variable since politically unstable countries are plausibly less prone to concern themselves with institutional reforms that delegate power to central banks (Cukierman, 1994).

We add two more control variables. The first is the CBI index developed by Cukierman et al. (1992), to analyze whether the 2003 level of CBI depends on the level of CBI before the intense reform period of central banks took its start in the early 1990s. The second is a dummy for members of the ESCB (European System of Central Banks), since the Maastricht Treaty required the central banks of member states to be independent before the ESCB's establishment date.

Before turning to the empirical analysis, we note that missing data is a potential problem for us, as for many other studies using macro data. Table 2 shows the number of missing observations in the full sample and for advanced, emerging and developing countries.

[Table 2 near here]

The problem is largest for developing countries, especially for the three variables unemployment, pre-reform central-bank independence and federation. For emerging countries the problem is largest for unemployment and party fragmentation.

Since missing data (if not random) can obscure the results, multiple imputation is used as a replacement method; see, e.g., Graham et al. (2003). Multiple imputation has been shown to produce unbiased parameter estimates which reflect the uncertainty associated with the missing observations. The method has further been shown to provide adequate results in presence of high

¹² Many risk management companies (e.g. RiskmetricsTM) use $\lambda=0.94$ in calculations of return volatility measures. In this study three different weights have been tested in the calculation of the EWMA coup measure to test the sensitivity of the estimation results for different weights: $\lambda=0.5$, $\lambda=0.75$ (the one reported) and $\lambda=0.94$. In general, a lower weight gives more weight to more recent observations in the calculation of the measure. The estimation results for the variable were, however, insensitive to the considered weights, i.e., similar results were obtained for the different weighting schemes.

rates of missing data (Schafer and Graham, 2002). An iterative Markov chain Monte Carlo method is used to impute missing observations. Rubin (1987) shows that there is little advantage in producing and analyzing more than a few imputed datasets. Based on this, the current study utilizes five imputed sets of data.

The empirical analysis is performed on each of these datasets and the estimation results for each are later combined, using the rules established by Rubin (1987), to produce one set of estimation results. The means and standard deviations for all variables (with imputed values) averaged over the five data sets are shown in Table 3.

[Table 3 near here]

4. Empirical Analysis

4.1. Empirical Strategy

The level of central-bank independence, which we regard as a product of a set of economic and political factors (as outlined in section 3.2), is observed at the end of 2003. A potential problem when deciding on what years of the economic and political background variables to include is that the level of central-bank independence observed in 2003 was achieved through reforms in different years prior to 2003. Analyzing the cross-section of central-bank independence levels in 2003 with explanatory variables measured during the reform period would then risk including values corresponding to time periods *after* the actual central-bank independence level was achieved. This could bias our inference since, for example, the level of independence would affect inflation.

To avoid this possible risk of biased inference, we let the ten-year periods before the years in which central-bank independence reforms occurred (as reported in Daunfeldt et al., 2009) determine the values of the explanatory variables (with the exception of social trust).¹³ Hence, for a country recorded to have undertaken a major central-bank independence reform in 1998, we assume that this was the year when the level of central-bank independence observed in 2003 was achieved. For such a country, we would therefore use the average value of the explanatory variables in 1988–1997, and in this manner we use individual time periods for each country.

There still is some subjectivity involved in dating the relevant central-bank independence reform, implying that we might include values measured after the observed level of central bank independence was achieved. Therefore, as the wave of central-bank independence reforms started in the beginning of 1990s and has continued onwards, we also take the safe route and let the mean of the pre-reform period (1980–1989) determine the values of the explanatory variables. Here we use the same time period for all countries. The drawback with this approach is that there is less precision in terms of time. For example, for a country that undertook a reform in 1998, only values up until 1989 are used for the explanatory variables, which is arguably a great gap. We present these results, which can be seen as a sensitivity analysis, in the Appendix.

¹³ Models using five-year periods have also been estimated. All results remain qualitatively the same.

Unlike the other explanatory variables, our main variable of interest, social trust, is not measured as the average of annual values during the 1980s or of the ten-year average of the decade before reform was undertaken. Instead, for this variable, we use the average of all available observations, based on all waves from the World Values Survey and complementary surveys asking the same question. This implies that the values derive from a period from the early 1980s until the mid-2000s. We argue that this is not a severe problem, both because social trust is a stable variable that changes little over time (cf. Hooghe and Stolle, 2003) and because there is no strong theoretical reason to expect central-bank independence to influence the level of social trust in society. In addition, there are relatively few observations available, which means that we would experience a severe loss in data if we used the same approach as for the other explanatory variables.

Table 4 shows descriptive statistics for the explanatory variables, based on the five imputed samples, when computed as averages for the pre-reform period (1980–1989) and as the ten-year averages before *CBI* reforms were undertaken in different countries.

[Table 4 near here]

4.2. Empirical Model

Our dependent variable, central-bank independence (CBI), is measured in terms of an index bounded between zero and one. This restriction on the dependent variable makes linear regression unattractive since it may yield fitted values that exceed the lower and upper bound. Also, the effect of explanatory variables tends to be non-linear and the variance tends to decrease when the mean gets closer to one of the boundaries. To account for this feature of the data, we use a regression model based on the beta distribution. Following Ferrari and Cribari-Neto (2004), the density of the beta distribution is parameterized as

$$f(y | \mu, \phi) = \frac{\Gamma(\phi)}{\Gamma(\mu\phi)\Gamma((1-\mu)\phi)} y^{\mu\phi-1} (1-y)^{(1-\mu)\phi-1}, 0 < y < 1, \quad (1)$$

where $E(y) = \mu$ and $\text{var}(y) = V(\mu)/(1 + \phi)$ is the mean and variance of the distribution, respectively. Note here that the mean is bounded between zero and one, i.e., $0 < \mu < 1$, and that $\phi > 0$ can be interpreted as a precision parameter in the sense that, for fixed μ , the larger the value of ϕ , the smaller the variance of y . By use of a logit linking function for the mean, explanatory variables are introduced in the model, as follows:

$$\mu = \frac{\exp^{x_i^T \beta}}{1 + \exp^{x_i^T \beta}},$$

where $x_i^T = (x_{i1}, \dots, x_{ik})$, $i = 1, \dots, n$, are the k explanatory variables for the sample of n countries and $\beta = (\beta_1, \dots, \beta_k)$ is a vector of unknown regression parameters. The parameters are identified by maximum likelihood based on the above beta density.

5. Empirical Results

The baseline estimation results, combined over the five imputed data sets and based on the beta distribution, are displayed in Table 5. Results are presented for the full central-bank independence index, as well as for the two sub-indices in order to distinguish between political and economic independence.

[Table 5 near here]

Looking at statistically significant results, they indicate that social trust is negatively related to the level of central-bank independence in emerging and developing countries. This holds for the full CBI index and for political independence. This implies that emerging and developing countries with a high level of social trust tend to have less independent central banks. One interpretation is that such countries do not need independent central banks to the same extent, since trust serves as an informal institution which substitutes for a credible formal institution. If there is social trust, the basic credibility problem of monetary policy can be expected to be minor to begin with.¹⁴

However, when we look at the results for developed countries, the sign of social trust is positive but only weakly statistically significant for economic independence. This suggests that in these countries, trust is not really very important for the degree of central-bank independence and that it, if anything, contributes to more (economic) independence. The non-importance could be seen as a result of developed countries already having established forms of cooperation that can be used for reforms and that may work and be credible irrespective of the general trust level. It could also reflect that there are already formal institutions in place that mitigate problems with time inconsistency and skepticism towards delegating power to others. The positive sign indicates that to the extent that trust does play a role, it further facilitates consensus and the reaching of agreement with regard to the letting non-politicians making important decisions.

Table 5 also indicates that politicians give their central banks more political independence when their country has a history of high inflation. This supports Hayo's (1998) claim that the degree of central-bank independence is related to a historical feedback process, suggesting that CBI reforms are implemented because high historical inflation creates stronger preferences for lower inflation.

Highly political fragmented countries have a higher degree of central-bank independence than countries characterized by less political competition, supporting results presented by Daunfeldt et al. (2009). This might indicate that politicians are afraid that they will be replaced, and therefore eager to tie the hands of incoming governments. The frequency of coups does not seem to influence the level of central-bank independence. However, the ESCB dummy is positive and statistically significant, most likely capturing that members of the ESCB were required to make their central banks more independent from the politicians.

¹⁴ One might say that for a country with high trust, CBI is not really needed, but if it were needed, it could quite easily be established. This points at the general benefit of having high trust in a society.

The federation dummy is not significant for the full sample, but the division into political and economic independence indicates that federations have a higher level of political independence and a lower level of economic independence than non-federations. Thus, effects that are present in the sub-indices are wiped-out when they are aggregated. Finally, countries with a high degree of central-bank independence in the pre-reform period are more likely to have a higher degree of economic independence in the post-reform period, whereas the level of political independence is unaffected.

The picture that emerges shows that most of the explanatory variables are not statistically significant, which is especially interesting since they are frequently used in the previous literature trying to explain central-bank independence and since social trust has not previously been used for this purpose (see, e.g., de Haan and Van't Hag, 1995; Cukierman and Webb, 1995; de Haan and Siermann, 1996; Bagherei and Habib, 1998; Hayo and Hefeker, 2002; Carmignani et al., 2008; Hayo and Voigt, 2008).

In order to make the size of the effects clear, as well as indicate the loss in efficiency due to missing observations, we also present marginal effects (ME) and the percentage of the total variation which is due to variation in the point estimates between the five imputed samples in Table 5. The marginal effects show the change in the predicted dependent variable for a unit change in the explanatory variable, assuming that the effect does not change over that interval of each variable, while keeping all variables at their mean values. Note here that the marginal effect for social trust reported in Table 5 is calculated for a change from zero to 100 percent, i.e. from no to complete social trust.¹⁵ The marginal effect calculated for social trust in developing countries for the full CBI index (coefficient of -0.469) implies that a ten percent increase in social trust lowers, on average, the level of CBI with -0.05. The marginal effect calculated for the same variable for a shift in social trust from the lowest (Cape Verde) to the highest (Saudi Arabia) level in the sample of developing countries indicates an effect of -0.32. That is, changing the level of social trust from 3.4 percent (Cape Verde) to 53 percent (Saudi Arabia) lowers, on average, the level of CBI with 0.32 (where the maximum level is 1). This is arguably a sizeable effect. The uncertainty added due to missing observations for the same estimate, i.e., for social trust in developing countries for the full CBI index, is 20.5 percent, as indicated in Table 5.

As mentioned, as an alternative to using the average values of the ten years preceding central-bank reform for the explanatory variables, we use the average values for 1980–1989. The estimation results are presented in Table A1 in the Appendix, and they are qualitatively similar to our preferred model specification, reported in Table 4 and discussed above, with the exception of there being even weaker support of a positive relationship between social trust and CBI in developed countries.

6. Concluding Remarks

The worldwide increase in central-bank independence is one of the most important and significant trends in international politics during the two last decades. The theoretical background behind this

¹⁵ For example, the marginal effects coefficient of -0.469, as obtained for social trust in developing countries for the full CBI index, then indicates that the level of CBI would be 0.469 lower in a country with 100 percent social trust compared with a country with no social trust. The interpretation is similar for the other marginal effects concerning social trust.

policy development is the time-inconsistency problem in monetary policy (Kydland and Prescott, 1977; Barro and Gordon, 1983), suggesting that a low inflation goal will not be credible since the public will not trust politicians to keep their promise to stabilize inflation at a low level. Researchers such as Rogoff (1985) and Persson and Tabellini (1993) have focused on designing institutional arrangements that make a low-inflation rule credible, which has usually meant some removal of monetary policymaking authority from elected politicians.

The purpose of this paper has been to try to explain central-bank independence as a function of a set of economic and political variables – and, in particular, to investigate the relationship between social trust and central-bank independence. Interestingly, no previous study of the determinants of central-bank independence have analyzed this relationship, in spite of there being a natural link between the basis for making central banks more independent – i.e., a credibility or lack-of-trust problem – and social trust, arguably one of the most studied factors in the social sciences in recent years.

On grounds of theory, it is unclear whether social trust affects the central-bank independence level positively or negatively. Speaking in favor of a positive effect, social trust could make central-bank independence reforms more probable, since it entails lower transaction costs of political agreement. It might also be easier for politicians to delegate power to independent central bankers since politicians in high-trusting societies not only trust each other, but also independent central bankers. On the other hand, the time-inconsistency problem could be smaller in high-trusting societies since the credibility of political decision-making is higher to begin with. Thus, trust can be seen as an informal institution which is a substitute for a credible formal institution. The credibility problem with a low inflation goal might be negligible if people in general (which may include politicians and central bankers) are trusting, consequently eliminating the need to delegate power to an independent central bank. The theoretically ambiguous effect means that the presence and sign of an effect of trust on the level of central-bank independence must be investigated empirically.

Our results, based on the central-bank independence indices of Arnone et al. (2007) and trust data from the World Value Surveys, indicate that social trust is *negatively* related to the level of central-bank independence in emerging and developing countries. Hence, high-trusting countries seem to have been less prone to delegate power to independent central banks compared to countries characterized by a lower level of social trust. A plausible interpretation is that where trust is low, a credible low-inflation monetary policy requires a formal institution in charge of such a policy, whereas high trust levels remove a need for such a formal institution. In contrast, trust does not seem to matter for the level of central independence in developed countries, although there are some weak signs of a positive relationship. This non-importance could result from there being informal and formal forms for cooperation and for achieving reform in developed countries that make trust redundant in this regard. To the extent that it plays a role, the positive sign suggests that it further facilitates agreement and confidence in letting non-politicians assume power over monetary policy.

Why is this important? We suggest that we contribute to a better understanding of why central-bank independence has been implemented in many countries, by introducing a new variable that has increasingly been shown to matter for economic, political and social outcomes. Pinpointing

the determinants of this type of independence is in turn important since it has been shown to be conducive to lower inflation, a widely shared policy goal.

There is surely more work to be done in this area. Future studies could, e.g., try to address the causality problem in novel ways, possibly through case studies and studies that more clearly identify exogenous variation. Other trust measures could also be used to complement our findings, such as trust in the central bank. Lastly, we suggest that social trust is a suitable candidate for future studies on what makes institutional change and reforms in general come about.

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Tables

Table 1: Level of central bank independence in pre-reform period (CBI₈₉) and post-reform period (CBI₀₃)

	Full sample		Advanced		Emerging		Developing	
	CBI ₈₉	CBI ₀₃	CBI ₈₉	CBI ₀₃	CBI ₈₉	CBI ₀₃	CBI ₈₉	CBI ₀₃
Mean	0.350	0.586	0.430	0.766	0.300	0.649	0.323	0.513
S.d.	0.179	0.197	0.184	0.178	0.150	0.185	0.175	0.163
Min	0.090	0.190	0.190	0.380	0.090	0.250	0.090	0.190
Max	0.820	1.000	0.810	0.940	0.550	1.000	0.820	0.940
Number of countries	73	149	24	26	24	31	25	92

Table 2: Number of observations for explanatory variables, 1980-2003

	Full sample		Advanced		Emerging		Developing	
	Missing	Percent	Missing	Percent	Missing	Percent	Missing	Percent
Pre-reform CBI	1824	51%	48	8%	168	23%	1608	73%
Inflation	428	12%	0	0%	103	14%	324	15%
GDP per capita	336	9%	0	0%	83	11%	253	12%
Unemployment	1974	55%	46	7%	267	36%	1661	75%
Federation	1656	46%	24	4%	168	23%	1464	66%
IMF credits	50	1%	0	0%	0	0%	50	2%
Party fragmentation	1494	42%	38	6%	231	31%	1225	55%
Coups	0	0%	0	0%	0	0%	0	0%
Social trust	1104	31%	0	0%	24	3%	1080	49%
Number of observations	3576		624		744		2208	

Table 3: Descriptive statistics for explanatory variables, 1980–2003

	Full sample		Advanced		Emerging		Developing	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Social trust	0.24	0.13	0.40	0.13	0.22	0.10	0.21	0.11
Pre-reform CBI	0.35	0.18	0.43	0.18	0.30	0.15	0.32	0.17
Inflation	0.24	0.66	0.06	0.17	0.33	0.81	0.26	0.68
GDP per capita	7520	7755	18434	8140	6314	3934	4843	5670
Unemployment	9.19	5.17	7.15	4.37	8.56	4.95	9.98	5.26
Federation	0.15	0.36	0.24	0.43	0.27	0.44	0.09	0.29
IMF credits	0.28	1.00	0.01	0.06	0.67	1.94	0.23	0.52
Party fragmentation	5848	2112	6521	1665	6331	1883	5495	2217
Coups	0.19	0.50	0.06	0.28	0.14	0.36	0.25	0.57
ESCB membership	0.17	0.38	0.61	0.49	0.32	0.47	-	-
Number of observations	3576		624		744		2208	
Number of countries	149		26		31		92	

Note: Number of observations and countries pertain to single samples (the same number for each of the five imputed samples). Means and standard deviations are averages over the five imputed samples, i.e., the average for each variable is calculated for each imputed sample and then the average of these averages is then calculated and shown in the table.

Table 4: Descriptive statistics for explanatory variables (full sample), for the pre-reform period 1980-89, and ten years before the CBI reforms were implemented

	<u>Pre-reform 1980–1989</u>		<u>Ten years before CBI reform</u>	
	Mean	s.d.	Mean	s.d.
Social trust	0.25	0.12	0.25	0.12
Pre-reform CBI	0.35	0.12	0.35	0.12
Inflation	0.25	0.38	0.29	0.42
GDP per capita	6161	5384	7992	7968
Unemployment	8.97	3.15	9.22	0.32
Federation	0.15	0.28	0.44	0.49
IMF credits	0.28	0.99	0.23	0.49
Party fragmentation	5631	1467	5934	1444
Coups	0.22	0.46	0.19	0.43
ESCB membership	0.17	0.38	0.17	0.38
Number of observations	149		149	

Table 5: Beta regression results aggregated over five imputed samples

Variable	CBI – full index				Political independence				Economic independence			
	Est	s.d.	ME ^a	% ^b	Est	s.d.	ME	%	Est	s.d.	ME	%
Social trust _{developed}	0.340	0.580	0.081	7.5	0.252	0.903	0.063	3.3	1.597*	0.840	0.331	4.9
Social trust _{emerging}	-1.296*	0.772	-0.311	5.2	-2.676*	1.506	-0.668	3.3	0.489	1.618	0.10124	2.2
Social trust _{developing}	-1.957***	0.662	-0.469	20.5	-2.629***	1.131	-0.656	18.4	-1.459	0.932	-0.30216	8.9
Pre-reform CBI	0.463	0.486	0.111	0.9	-1.224	0.759	-0.305	1.4	2.044***	0.537	0.423	3.0
Inflation	0.234*	0.137	0.0561	10.1	0.593***	0.240	0.148	6.8	0.157	0.200	0.033	3.2
GDP per capita	-0.126	0.0941	-0.03	7.4	-0.129	0.128	-0.032	1.2	-0.167*	0.100	-0.035	8.4
Unemployment	0.0519	0.168	0.0124	13.4	0.062	0.247	0.016	2.4	0.132	0.235	0.027	7.5
Federation	0.077	0.13	0.019	27.3	0.432**	0.218	0.107	21.8	-0.310**	0.144	-0.065	12.5
IMF credits	-0.057	0.091	-0.014	11.3	-0.121	0.172	-0.030	8.4	-0.168	0.112	-0.035	2.0
Party fragmentation	1.672***	0.445	0.401	5.8	1.553***	0.605	0.388	2.9	1.34***	0.540	0.278	7.1
Coups	-0.047	0.101	-0.011	2.9	-0.203	0.215	-0.051	7.6	0.052	0.176	0.011	8.2
ESCB membership	1.154***	0.214	0.244	5.7	1.764***	0.297	0.379	7.0	0.280	0.291	0.056	1.3
Constant	-0.685	0.381		2.7	-0.525	0.592		1.8	-0.495	0.486		4.1
Log-likelihood	90.058				47.994				82.558			
Observations	149				149				149			

Note: Dependent variables are the level of total central bank independence, political independence and economic independence using the indices presented by Arnone et al. (2007). The explanatory variables are the average of the values for the ten-year period preceding CBI reform (different time periods in different countries). ^a Marginal effects, showing the marginal effect of each variable, while keeping all variables at their mean values. The marginal effect is the change in the predicted dependent variable for a unit change in the explanatory variable, assuming that the effect does not change over that interval. ^b % shows the percentage of the total variation which is due to variation in the point estimates between the five samples.

Appendix

Table A1: Beta regression results aggregated over 5 imputed samples

Variable	CBI-full index				Political independence				Economic independence			
	Est	s.d.	ME ^a	% ^b	Est	s.d.	ME	%	Est	s.d.	ME	%
Social trust _{developed}	-0.446	0.604	-0.107	7.6	-1.193	0.939	-0.298	9.3	1.305	0.844	0.271	3.9
Social trust _{emerging}	-1.453*	0.782	-0.348	5.7	-2.94*	1.558	-0.73374	4.0	0.398	1.600	0.08252	2.0
Social trust _{developing}	-2.068***	0.788	-0.496	14.5	-2.67**	1.238	-0.66536	18.6	-1.578	1.037	-0.32742	4.7
Pre-reform CBI	0.179	0.519	0.043	0.7	-1.273	0.810	-0.318	0.2	1.686***	0.551	0.350	1.2
Inflation	0.250*	0.141	0.060	6.1	0.147	0.225	0.037	11.0	0.535**	0.246	0.111	3.4
GDP per capita	0.023	0.141	0.005	0.7	0.108	0.202	0.027	0.4	0.024	0.139	0.005	5.9
Unemployment	0.013	0.191	0.003	26.1	0.212	0.290	0.053	22.5	-0.015	0.270	-0.003	18.6
Federation	0.346*	0.201	0.083	3.3	0.650***	0.315	0.162	1.8	-0.107	0.322	-0.022	3.7
IMF credits	-0.043	0.033	-0.010	3.4	-0.061	0.051	-0.015	2.5	-0.039	0.064	-0.008	0.4
Party fragmentation	1.22***	0.484	0.293	12.4	1.854***	0.706	0.463	18.9	0.301	0.525	0.063	11.8
Coups	-0.128	0.109	-0.031	3.4	-0.460***	0.189	-0.115	2.4	0.194	0.180	0.040	0.7
ESCB membership	1.264***	0.203	0.263	1.8	1.697***	0.269	0.368	1.4	0.494*	0.295	0.095	0.1
Constant	-0.295	0.356		8.3	-0.513	0.585		11.3	-0.025	0.522		9.0
Log-likelihood	85.924				45.612				80.466			
Observations	149				149				149			

Note: Dependent variables are the level of total central bank independence, political independence and economic independence using the indices presented by Arnone et al. (2007). The explanatory variables are the average of the values for the ten-year period preceding the general reform period, i.e., for 1980–1989 (the same for all countries).^a Marginal effects, showing the marginal effect of each variable, while keeping all variables at their mean values. The marginal effect is the change in the predicted dependent variable for a unit change in the explanatory variable, assuming that the effect does not change over that interval. ^b % shows the percentage of the total variation which is due to variation in the point estimates between the five samples.