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Superstar Central Bankers

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Superstar Central Bankers*

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Abstract

The personalities of central bankers moved center stage during the recent financial crisis. Some central bankers even gained "superstar" status. In this paper, we evaluate the pivotal role of superstar central bankers by assessing the difference an outstanding governor makes to economic performance. We employ school grades given to central bankers by the financial press. A superstar central banker is one receiving the top grade. In a probit estimation we first relate the grades to measures of economic performance, institutional features, and personal characteristics. We then employ a nearest neighbor matching approach to identify the central bankers which are closest to those receiving the top grade and compare the economic performance across both groups. The results suggest that a superstar governor indeed matters: a top-graded central banker faces a significantly more favorable output-inflation trade-off than his peers.

Keywords: Central banking, inflation expectations, monetary policy, nearest neighbor matching.

JEL classification: E52, E58

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”You’ve heard of an international market for superstar soccer players. We need an international market for superstar central bankers.”
Matthew O’Brien, April 19 2012¹

1 Introduction

On November 26, 2012, the British Chancellor of the Exchequer announced the appointment of Mark Carney as the next Governor of the Bank of England. At that time Carney served as the Governor of the Bank of Canada. This was the first time an acting central bank governor was headhunted to lead another central bank.

This incidence is symptomatic for the personalities of central bank governors moving center stage during the recent financial crisis and the subsequent Great Recession. Some central bankers, such as Mark Carney, even gained ”superstar” (Financial Times, 2013) status. Another example is Mario Draghi, president of the European Central Bank, whom the public dubbed ”Super Mario”. Mario Draghi and Jens Weidmann, the president of the Bundesbank were recently characterized as ”rock-star” central banker (FAZ, 2013). A decade ago, a ”cult of personality” (Blinder and Reis, 2005) emerged around Alan ”The Maestro” Greenspan, who was probably the role model of a superstar central banker. Yet even his predecessor, Paul Volker, was nicknamed the ”gentle giant”.²

Attached to these characterizations is the hope that an exceptionally charismatic and highly competent governor could steer the economy through an expedited recovery from the recession and a more favorable output-inflation trade-off in general. As central banks these days rely more on unconventional measures of monetary policy such as forward-guidance and less on conventional interest rate policy, the success of these policies became even more dependent on how policy is perceived by the public. This shifts attention to the personalities of the central bankers involved. Whether the hope associated with hiring a superstar central banker is justified, however, is an open issue. The question of how much a good central banker is worth has not yet been addressed.

In this paper, we evaluate the pivotal role of the superstar central bankers empirically. We assess the difference a governor makes to the course of the business cycle and whether the superstar status some central bankers enjoy is justified based on economic performance. Given the complexity of the central bankers’ tasks and the

¹<http://www.theatlantic.com/business/archive/2012/04/how-much-is-a-good-central-banker-worth/256089/>

²Ball (2012) links Ben Bernanke’s cautious (relative to his own writings) policy stance to his personality.

multiplicity of shocks and factors driving economic performance, this is a complicated task.

An empirical analysis of superstar central bank governors faces two major challenges. The first is how to quantify the superstar status and the changes thereof. The second is to isolate the effect of the governor's personality on the economy while acknowledging that the superstar status is of course highly endogenous and reflects good economic performance. A low and stable rate of inflation and a sustainable path of economic growth, for example, are likely to qualify a central banker for a superstar status. Given the persistence of macroeconomic developments and the prevalence of good monetary policy, however, such an economy will continue to exhibit a favorable path in the future, independent of whether the central banker enjoys a superstar status or not. Hence, netting out the effect of status alone is not straightforward. Of course the impact is highly dependent on the institutional framework. We therefore control as much as possible for the institutional environment. We follow the approach of Malmendier and Tate (2009) in their seminal analysis of CEO performance to address these challenges in the following two-step procedure.

First, we hand-collect data on school grades regularly given to central bankers by the financial press. A superstar central banker is one receiving the top grade. Hence, the status can be gained and lost during our sample period. The school grades range from A to D and are given once a year, such that we have a panel structure at hand that allows us to study the determinants of each grade. We construct a data set for 29 countries covering the period 2001 to 2012. We use a probit approach to relate the grades to standard measures of economic performance, institutional variables, and central bank governors' characteristics. This gives us probabilities for a central banker with certain characteristics to receive the top grade.

Second, we employ a nearest neighbor matching approach to identify the central bankers which are closest to those receiving the top grade. We then compare the performance of economies under superstar central bankers to those economies which are not fortunate enough to have a superstar governor heading its central bank. By doing this we isolate the effect of the central banker's status on economic outcomes. Detecting a markedly favorable development in the former economy would be indicative for the conducive role of a superstar governor. This would also indicate that the personality of the central banker matters beyond and above the central bank as an institution.

Of course the incentive problems of firms are not identical to those of central banks. In fact, the large degree of central bank independence complicates the governance

structure of central banks. In light of this, there is a role for the evolution of superstars even in central banking. The independence of the monetary authority, possibly with a central banker having an objective function different from that of the social planner, does not make personalities irrelevant. Friedman (1962, p. 235) argues that an independent central bank "is extraordinarily dependent on the particular personalities involved". Since the incentive for reputation building is a strong governance mechanism, this leaves room for the evolution of personalities and even superstars. In addition, new tasks of central banks beyond narrowly defined monetary policy such as banking supervision and maintaining financial stability offer even more room for building an outstanding public profile.

A priori the effect of superstar status on economic performance is ambiguous. An outstanding central banker could lead to anchored inflation expectations and, hence, raise the central bank's credibility such that the sacrifice ratio falls. In an ailing economy a superstar central banker could also be a boost to private sector confidence and therefore being supportive to consumption and investment. A prominent central banker could raise the public's trust in the central bank's strategy, in particular so if unconventional policies lead the central bank into uncharted territories. Furthermore, such a central banker might be seen as an insurance for avoiding particularly severe recessions or financial crises. These channels would explain why the economies of superstar central bankers outperforming others.

However, there could also be detrimental effects. If a highly respected central banker devotes too much attention to international fora, academic conferences, etc., the quality of policy could suffer. Moreover, his peers receiving less favorable grades might feel the pressure to improve their performance which would eventually narrow the gap between the performance of superstar-led economies and the rest.

Our results suggest that superstar central bankers indeed matter. Under a top-graded central banker, the real growth rate of GDP at the end of the award year is about 0.74 percentage points (pp) higher compared to an economy under a central banker as close as possible to the superstar. In addition, the expected real growth rate of GDP is 0.33 pp higher at the end of the award and 0.56 pp in the year thereafter. In contrast, there is no significant difference in terms of inflation (expectations) during the two years after the award. This suggests that the additional reputation of top-graded central bankers helps improve the output-inflation trade-off. Overall, our results suggest that hiring a superstar central banker pays off.

The remainder of this paper is organized as follows: Section two embeds this paper into the related literature and highlights our contribution. Section three introduces

the data set and the econometric methodology. Section four explains the central bankers' status with institutional variables, person-specific variables, and macroeconomic outcomes. Section five sheds some light on the actual worth of a superstar central banker in terms of subsequent macroeconomic performance compared to his peers. Some extensions and robustness checks are documented in section six. Section seven concludes.

2 Related literature and our contribution

It is widely acknowledged that the institutional design of a central bank matters for the short- to medium-run economic performance of a country. Issues such as independence and accountability of monetary policy, a clear mandate on price stability, and a fair degree of transparency contribute to efficient macroeconomic stabilization. We do not know, however, whether the personalities of individual central bankers matter above and beyond what is already represented by the institutions they are heading. While the fact that monetary policy decisions are often taken by committees is frequently interpreted as a means to move policy away from individuals to collectives, we recently see the (re-)appearance of strong and popular central bank leaders.

A small literature deals with the impact of central banker personalities, as opposed to central bank characteristics, on economic outcomes.³ Siklos (2002) offers an early attempt to link central bank personalities to policy outcomes. Some anecdotal remarks are discussed in Mehrling et al (2007). One strand of the literature looks at the determinants and the effects of a replacement of the central bank governor. Dreher et al (2008) show that the probability of replacement increases with years in office, the degree of political instability, and the level of inflation. Furthermore, Dreher et al (2010) estimate the probability for a replacement of the governor before the end of his term in office. Again, mainly political variables drive the probability of replacement. The replacement of a central bank governor also reveals information about the likely course of future policy which is reflected in financial market responses. Kuttner and Posen (2010) show that exchange rates respond significantly to the announcement of a replacement at the top of the central bank. These announcement effects are stronger if the central bank has no credible nominal anchor or if central bank independence is underdeveloped.

³Besides this empirical literature, much work has been devoted to analyzing reputation building and signaling of central bank governors theoretically. See Backus and Driffill (1985a), Backus and Driffill (1985b), Barro (1986), Vickers (1986), Sibert (2002), and Sibert (2003).

Another strand of research assesses the impact of policymakers' education and career background on policy outcomes. Göhlmann and Vaubel (2007) study the members of monetary policy committees of European economies prior to EMU. They find that former central bank staff members who have been promoted to sit on the policy committee prefer lower inflation than other members. Likewise, Havrilesky and Schweitzer (1990), Havrilesky and Gildea (1991a), Havrilesky and Gildea (1991b), and Harris et al (2011) find that experience in government, in the central bank, in the industry sector, and in academia appears to be a source of variation in policy preferences. Farvaque et al (2011) use data from OECD countries and show that policymakers' background influences inflation and the effect of policymakers' experience is stronger in countries adopting inflation targeting. The role of insiders versus outsiders on monetary policy committees is studied by Besley et al (2008). Interestingly, they do not find differences across members' affiliations with respect to inflation and output responses. Neuenkirch and Neumeier (2013) use estimated instrument rules to explain differences across central bankers with different career backgrounds or party affiliations. They are able to show that party affiliation has more explanatory power than previous professional occupations. Another dimension of the personality of central bankers is addressed by Badinger and Nitsch (2013). They argue that national representation in the mid-level management of the European Central Bank helps explaining the observed interest rate policy.

A third strand of the empirical literature links monetary policy preferences of central bankers and their policy decisions to the administration under which they were appointed. For example, Chappell et al (1993) provide evidence for Democrat appointees at the Federal Open Market Committee voting differently on interest rate steps than Republican appointees.

None of these studies, however, addresses the superstar status of some selected central bankers and the economic performance following the enhancement of the governor to superstar status. In the following sections, we try to shed light on this issue.

3 Data and econometric methodology

Our empirical approach is inspired by the seminal work of Malmendier and Tate (2009). They essentially show that corporate CEOs significantly underperform over the three years following, for example, a CEO of the year-award.⁴ This result is

⁴Note that, in a more recent paper, Horsch (2013) finds that superstar CEO competitors outperform observationally equivalent CEOs.

established using a two-step procedure. First, they estimate a binary-choice model to identify observable firm and CEO characteristics that predict CEO awards. Second, they identify the non-winning CEOs which are closest to each actual award winner. The performance of the superstar CEOs and their nearest neighbors are then contrasted with each other.

3.1 The World's Top Central Bankers

We start by collecting data on central banker awards given by the financial press. These awards serve as a proxy for the superstar status of some central bankers. To the best of our knowledge, these central banker grades have not been used for a serious empirical investigation before. We use the "Central Banker Report Card" feature, published annually by *Global Finance* magazine, typically in July or August.⁵ The magazine grades central bank governors on an "A" to "D" scale for success in areas such as inflation control, economic growth goals, currency stability, and interest rate management. The magazine acknowledges that "subjective criteria also apply." Mark Carney, for example, was graded A in 2012 when he was governor of the Bank of Canada. It is important to note that these grades are given to central bank governors personally, not the policy of the central bank nor the performance of the monetary policy committee.⁶

The grades given by *Global Finance* receive substantial attention by the financial community. A key factor for the high media impact is that the grades are published right before the annual Jackson Hole symposium of the world's central bankers organized by the Federal Reserve Bank of Kansas City. For example, on August 23, 2012 Bloomberg reports "Bernanke Given B Grade in Global Finance Central Bank Study". The year before, on August 25, 2011 Bloomberg had the news that "Bernanke Given C Grade in Global Finance Central Bank Study".

The sample considered in this paper covers the period 2001-2012 and 29 central banks.⁷ Table A1 in the Appendix displays the central bankers which are part of

⁵See <http://www.gfmag.com/>.

⁶Of course, there are other awards like, for instance, the "Central Bankers of the Year Award" handed out annually since 2004 by the *The Banker* (<http://www.thebanker.com/Awards/Central-Bank-Governor-of-the-Year>). However, there are at least two major advantages of the "Central Banker Report Card". First, it is available online since the year 2001 rather than 2004 which results in three additional years of data. Second, there is a panel for 29 continuously graded central banks which allows us to contrast and comfortably match the award winners with their peers rather than artificially creating a control group out of all central banks worldwide.

⁷We focus on these 29 central banks since either (i) the grading of some other central banks started after 2001 or (ii) some of the variables used to explain the grading are not available for the complete sample period. The grades in 2012 are only used to evaluate the subsequent grading of superstar central bankers, i.e., these do not enter the probit estimations as macroeconomic data for

the annual grading and Table A2 shows the grade received by a country’s central banker over time. A first look at this data suggests that the world’s two largest central banks, the Federal Reserve and the European Central Bank, are graded not too favorably compared to, for instance, the Reserve Bank of Australia and the central bank of Malaysia. However, Table A2 also indicates that the grading of a single central banker can substantially change over time as, for instance, Jean-Claude Trichet was given a C during the first five years of his tenure and an A or B afterwards.

Figure 1 presents the grading of central bankers over time in a more condensed way and shows the distribution of grades over time. First, with 2008 being the only exception, the magazine tends to grade the central bankers more favorably over time. For instance, 43 percent of the governors are graded A or B in 2001. In 2012, this figure has increased to 82 percent. A priori, we do not know whether this reflects an improvement in central banking or just a laxer assessment of central bankers’ performance. In any case, we will control for year-fixed effects in the empirical analysis below. Second, approximately 19 percent of the central bankers get the best grade, and this figure is roughly stable over time with the years 2001, 2003, and 2008 being exceptions. The latter finding implies that the control group is four times larger than the treatment group which allows us to obtain an appropriate match for the superstar central bankers in a comfortable way. Finally, the magazine does not privilege central banks in the ten advanced economies⁸ or the 19 emerging economies⁹ since 18 top grades are handed out to governors in the former group (19.6%) and 35 to the latter group (19.8%).

3.2 Explanatory variables

Since the criteria by the *Global Finance* magazine are far from being exhaustive we consider a long list of potential determinants of the central bankers’ grades in the subsequent analysis. Table A3 in the Appendix summarizes these variables and the respective sources. Table A4 provides some descriptive statistics for the explanatory variables split for the top grade A and the other grades B-D. Table

end-2013—which is required for the calculation of treatment effects in Section 5—is not available at the time of this writing.

⁸Australia, Canada, Euro Area, Japan, Norway, New Zealand, Switzerland, Sweden, the United Kingdom, and the United States.

⁹Argentina, Brazil, Chile, China, the Czech Republic, Hungary, Indonesia, India, Israel, Korea, Mexico, Malaysia, Philippines, Poland, the Russian Federation, Singapore, Thailand, Turkey, and South Africa.

A5 gives an overview of all variables we additionally considered including into the analysis which, however, are left out for reasons illustrated there.

The variables can be assigned to two different groups. First, we explain the central bankers' grades with various *institutional* and *person-specific* factors. A dummy variable for the ten "advanced" central banks in the sample is included to test if these are—on average—graded differently than emerging market central bankers. The level of central bank transparency is used as an additional explanatory variable. Horvath and Vasko (2013) provide an update to the commonly used transparency index of Eijffinger and Geraats (2006), which we employ. Since parts of the empirical literature on central bank transparency (van der Crujisen et al, 2010; Neuenkirch, 2013) find that an intermediate degree of transparency is most favorable for the success of monetary policy, we also include this indicator as a squared variable to capture potential non-linear effects. Next, two dummy variables capture if the central bank is an inflation targeter (Roger, 2009) or has a freely floating exchange rate (Ilzetzki et al, 2010). In addition, we test if female central bank governors are graded differently than their male counterparts. Since the annual Jackson Hole Summit gathers a lot of media attention, we include a dummy variable for those central banker governors who have been invited as a presenter or discussant in the previous year. Finally, experience might also play a (non-linear) role in the grading of central bankers. Therefore, we include two variables measuring the (squared) years bygone since a governor has taken office.

Second, we also include *macroeconomic* variables such as the central bank target rate, real GDP growth, expected real GDP growth for the next calendar year, stock returns, and credit depth. The latter variable is included in a non-linear fashion as some preliminary regressions indicate that—when it comes to grading of central bankers—there is an optimal intermediate degree of credit depth. Since all central banks explicitly or implicitly target stable prices, we include four additional variables for inflation and expected inflation for the next calendar year into the analysis. For that purpose, we relate actual inflation and expected inflation to the central bank's target and create separate variables for absolute positive deviations and absolute negative deviations of (expected) inflation.¹⁰ Next, we proxy the "appropriateness" of the monetary policy stance using a forward-looking Taylor (1993) rule with 1.5

¹⁰The choice of the target value is straightforward in the IT economies. In case of the advanced economies without an official IT (ECB, JAP, SUI, US) and low-inflation emerging economies (CHN, MYS, SIN), we use 2% as proxy of an inflation target, whereas in case of "high-inflation" emerging economies (ARG, IND, RUS) we calculate deviations from a hypothetical 5% target. Finally, some of the IT economies adopted this regime for the first time during the sample period (HUN, IDN, KOR, MEX, NOR, PHI, TUR). In these cases, we employ the first officially announced IT value as proxy for a hypothetical IT before the actual start.

and 0.5 as weights for the expected inflation gap and expected output growth, respectively, and a time-varying real interest rate (Clarida, 2012). This hypothetical Taylor interest rate is then related to the actual interest rate set by the central bank and two separate variables measure if a too "hawkish" or too "dovish" monetary policy can explain the grading decision. Finally, we include a variable measuring currency crises for those countries where the exchange rate devalues by more than one standard deviation (Moser and Dreher, 2010).

3.3 Probit estimations

As mentioned before, we proceed in a two-step approach. First, we estimate a probit model to identify observable institutional and person-specific characteristics as well as macroeconomic outcomes that predict the grade A at the annual "Central Banker Report Card". The specification is as follows:

$$grade_{i,t}^* = \alpha + \beta X_{i,t} + \eta_t + \epsilon_{i,t} \quad (1)$$

$grade_{i,t}^*$ is the latent continuous variable representing the grading decision. We use a binary variable (1 represents the grade A and 0 the grades B, C, and D, respectively) to describe the decision by the *Global Finance* magazine.¹¹ The vector X contains institutional and person-specific characteristics as well as macroeconomic variables as described before. Year-fixed effects are captured by η_i and the residuals $\epsilon_{i,t}$ are assumed to follow a standard normal distribution, which implies that the probabilities of the different outcomes can be written as:

$$Pr[grade_{i,t} = 1|Z_{i,t}] = \Phi(Z'_{i,t}\delta) \quad \text{and} \quad Pr[grade_{i,t} = 0|Z_{i,t}] = 1 - \Phi(Z'_{i,t}\delta) \quad (2)$$

Φ denotes the cumulative standard normal distribution, Z_t is the vector of explanatory variables and year-fixed effects, and δ the vector of coefficients.

Figure 2 provides an illustration on the timing of (i) the grading and (ii) the assumptions on the information sets used for the probit estimations and the calculation of the treatment effects. We use end of previous year data for the probit estimation for three reasons. First, this ensures comparability across variables since some of these variables are available at a high frequency (for instance, stock returns) while others (for instance, the transparency index or the de facto measure of the exchange

¹¹In Section 6.1, we show a robustness test where we estimation Equation (1) using an ordered probit model.

rate regime) are available at annual frequency only. Second, we reduce potential endogeneity problems which might arise due to reputational effects when we use data from the year in which a central banker is considered a superstar. Finally, we can be sure that all of the variables are actually observable to the *Global Finance* magazine journalists at the time of their grading decision.

3.4 Calculation of treatment effects

Second, we use the a nearest neighbor matching approach to identify the central bankers which are closest to those receiving the top grade. The subsequent performance in terms of macroeconomic outcomes of the latter group, i.e., the control group, is then contrasted with that of superstar central bankers. The resulting average treatment effect on the treated provides us an estimate of the influence of superstar central bankers compared to those individuals that are most similar, but do not get the top grade.

Nearest neighbor matching attempts reducing the bias due to confounding variables that could be found in an estimate of the treatment effect obtained from simply comparing outcomes across groups. The possibility of a bias arises because the apparent difference between these two groups may depend on characteristics that affected whether or not a unit received a given treatment instead of the effect of the treatment itself. Nearest neighbor matching attempts to mimic randomization by creating a sample of units that received the treatment that is comparable on all observed covariates to a sample of units that did not receive the treatment.

A concern is that the remaining heterogeneity—which is not correlated with the explanatory variables—across superstar central bankers and their matches biases our estimation. To minimize this concern, we include a large number of explanatory variables to ensure that award winners and those in the control sample are indistinguishable along most observable dimensions. Therefore, the differences in terms of subsequent macroeconomic performance between the top-graded central bankers and their nearest neighbors should be due to unobservable characteristics or, put differently, the superstar status.

One problem associated with that procedure is that some of the top-rated central bankers and some of the nearest neighbors retire during the year after the award was handed out. Since this paper is interested in the impact a superstar central banker has compared to her/his peers, we drop these observations for the calculation of treatment effects for the year $t + 1$. On the other hand, monetary policy is typically associated with a considerable outside lag. To account for this phenomenon,

we conduct a robustness test where we compare the influence of superstar central bankers during the year $t + 1$ even if they have left office before.

One caveat seems to be warranted. A major tendency in central banking over the past two decades is the increasing role of collective decision making by monetary policy committees (MPC). Prominent central bank governors often lead MPCs with other charismatic policymakers, either as deputy governors or ordinary MPC members. It cannot be ruled out completely that the superstar status of a single governor in fact reflects the superstar status of the MPC at a whole or at least a substantial fraction of it. On the other hand, being a superstar might imply that the governor has de facto more authority in the monetary policy committee or vis-a-vis the government. For that purpose, an analysis of the voting behavior before and after a governor is considered a superstar would be an interesting future task of research.¹²

4 Explaining central bankers' status

Table 1 shows the results for the probit estimation of Equation (1). To conserve space, we mostly concentrate on the significant variables in the following interpretation.

First, some of the person-specific characteristics significantly explain the grading of central bankers. In particular, more experience in office increases the probability of becoming a superstar central banker. However, this effect is partly offset by the coefficient of years in office squared which is negative and significant. Thus, markets need some time to assess a governor's performance before giving the top grade. Staying in office for too long, however, reduces the probability of getting an A. The maximum positive effect is found after 8.9 years when the conditional likelihood of being awarded with an A is 32.4 pp higher than for a governor without any experience in office.¹³

Female governors are more likely to get the top grade. The conditional probability of being a superstar central banker is 28.5 pp higher for the four female governors in our sample (Mercedes Marco del Pont, Zeti Akhtar Aziz, Tarisa Watanagase, and Gill Marcus) than for their male counterparts. While we do not take a firm stand on the reason behind this result, there are several hypotheses one could put forward to explain this finding. Female governors might simply be more charismatic

¹²We would be happy to include such a measure into this paper. However, the number of central banks publishing voting records is not sufficiently large enough to conduct such an analysis.

¹³Examples for top-graded governors with a lot of experience in office are Zeti Akhtar Aziz (2009, 9 years; 2010, 10 years; 2011, 11 years) and Tito Mboweni (2008, 9 years).

or more talented than their male counterparts as raising the ranks of the male-dominated central bank is harder for them. Alternatively, the press could honor the appointment of a female governor as a signal of more liberal overall policies, in particular so in emerging economies, and *ceteris paribus* give a higher grade.

Being invited as a presenter or discussant at the Jackson Hole Summit is an indication that a central banker is considered as being outstanding in the profession. This is also reflected in an increase of the conditional likelihood of being a top-rated central banker by 12.5 pp in the subsequent year. However, this effect is not statistically significant at the five percent level.

Second, only one of the institutional variables significantly explains the grading. Central bankers who work under a freely floating exchange rate regime (as defined by Ilzetzki et al, 2010) are 19.3 pp more likely to being awarded the top grade A. Maintaining a floating exchange rate might be seen as a good insurance against a painful currency crisis and, hence, rewarded by a good grade. In contrast, an explicit inflation targeting regime or a higher degree of transparency is not significantly increasing the likelihood of being a superstar central banker.

Since only one of the institutional factors considered in the probit estimation significantly explains the grading, we can conclude that the press abstracts mostly from the institutional framework when awarding their grades. Instead, it seems that is indeed the individual governor that is subject to the evaluation.

Finally, turning to the macroeconomic variables, we find that the degree of credit depth significantly explains the grading of central bankers. Similar to the governors' experience, the effect is non-linear. Up to a ratio of domestic credit to the private sector over GDP of 67.4 percent the likelihood a becoming a superstar central banker increases with a maximum change of plus 17.3 pp. For higher ratios, the effect is decreasing. Therefore, credit expansion is appreciated by the press but only up to a degree which they consider as not too excessive. In addition, higher real GDP growth rates also contribute to a higher probability of being a top-graded central banker. A one pp increase improves a governors' conditional chances by 2.5 pp.

One obvious doubt when it comes to grading from a magazine from the financial world is that journalists might prefer governors well-known for dovish monetary policy. Our results indicate that such a claim is unjustified. Positive deviations of expected inflation from target are significantly penalized, whereas negative deviations are not. A one unit increase in the former variable reduces the probability of being a top-graded central banker drastically by 14 pp. In addition, positive and negative deviations from Taylor's suggested interest rate lead to an almost perfectly symmetric decrease in the conditional chances of receiving the top grade A. The

marginal effects are -1.5 pp for too hawkish monetary policy and -1.6 pp for too dovish monetary policy. In addition, only the coefficient for too loose monetary policy is significant at the five percent level.

5 How much is a superstar central banker worth?

In this section, we isolate the pivotal effect the superstar status has on economic performance. The question we would like to answer is: does a superstar central banker really make a difference? For that purpose, we use a nearest neighbor matching approach to match the actual award winners with their nearest neighbor, i.e., a governor which in terms of the institutional and personal characteristics, and the previous macroeconomic performance is as similar as possible to the top graded governor. These governors are also referred to as "predicted winners".¹⁴ Before we turn to the treatment effects, we illustrate the macroeconomic performance of superstar central bankers, their nearest neighbors, and all non-superstar central bankers in Figure 3.

When it comes to the (expected) inflation gap, actual winners perform better than predicted winners at the end of the pre-award year and the end of the award year. At the end of the post-award year, this picture changes as the predicted winners perform better. The difference between both groups is never larger than 55 bps in case of the inflation gap. Since the expected inflation gap is, on average, never larger than 23 bps (predicted winners, end of award year) both groups are able to anchor inflation expectations well. A similar picture emerges when looking at the difference between these two groups in case of the central bank's target interest rate. Superstar central bankers have an, on average, lower interest rate over the first two years, whereas in the third year their target rate is slightly higher compared to the predicted winners. Most strikingly are the differences in case of (expected) real GDP growth. The difference between the winners and the predicted winners is positive all the time and it widens considerably at the end of the post-award year. Note that in both cases, the group of all non-winners performs "better" than its subgroup, the predicted winners.

These figures also illustrate why it is important to create an appropriate control group before calculating treatment effects since all non-winners perform considerably different than the predicted winners. Otherwise, the treatment effect would simply have been misestimated. In addition, these figures also show that the matching

¹⁴By doing so, we do not a priori restrict the control group to, say, the second-best grade B since 39.6 percent of the superstar central bankers are matched with a C or D counterpart.

procedure generated a really competitive control group as the predicted winners perform even better in case of some years and variables than the top-graded central bankers.

Next, to get a more formalized picture of the differences between superstar central bankers and their matches, we estimate the average treatment effects on the treated. First, we look a bit closer at the grading of top-graded central bankers and their nearest neighbor in the subsequent year. The average grade of superstar central bankers remains about -0.98 points lower on a scale from 1 (A) to 4 (D) which implies that there is some persistence in the grading. Second, to get an impression of the difference a top-graded central banker makes in terms of macroeconomic performance, Table 2 shows the treatment effects for the superstars compared to their peers at the end of the award year and the end of the subsequent year.

The tests confirm that there is no significant difference in case of inflation (expectations) and the central bank rate for top-graded central bankers compared to their nearest neighbors. Note that in in case of inflation at the end of the award year, the difference is "close" to being significant (p-value: 0.141). A more striking result, however, is obtained for (expected) real GDP growth. The difference in terms of realizations at the end of the award year between superstar central bankers and their counterparts is significant (at the ten percent level). In a superstar-led economy, GDP grows by 0.74 pp more than in an economy led by a predicted award winner. In addition, expected GDP is 0.33 pp and 0.56 higher at the end of the award and the end of the subsequent year, respectively.

Superstar central bankers do indeed perform better than their matches since they boost the economy in terms of higher GDP growth without generating significantly higher inflation (expectations). The emerging picture is consistent with a more favorable output-inflation trade-off for superstar central bankers. These are able to boost the economy by more than their counterparts without negative consequences in terms of higher inflation for this or the following year.

6 Extensions and robustness tests

In this section, we explore the robustness of our findings with respect to four extensions and modifications of the analysis.

6.1 Ordered probit estimations

Since we can explicitly distinguish between the non-superstar grades B, C, and D an obvious robustness test for the findings in Section 4 is to re-estimate Equation (1) using an ordered probit model. For this purpose, we create a discrete variable for the grades where, for a convenient interpretation, the top grade A has the highest value. Thus, positive (negative) coefficients can be interpreted as indicating a higher (lower) conditional probability of getting a better grade. Table 4 shows the results. In general, the results from the probit estimations are confirmed as there are only two minor differences. The coefficient for too dovish interest rates is now insignificant, whereas the dummy variable for ITs is now significant indicating that governors working under an inflation targeting regime have a higher conditional probability of receiving better grades.

6.2 Low transparency versus high transparency

Next, we test if the performance of superstars is different in central banks characterized by a low degree of transparency versus those working under a high transparency regime. The underlying idea is to explore if superstar central bankers—which we find to matter beyond their central bank—can compensate for "weak" institutions or not. For that purpose, we split the sample into two subgroups using the median value of transparency. The first group has a transparency index (Horvath and Vasko, 2013) which is smaller than 9, the second one is characterized by a figure of 9 or higher. In total, we have 143 observations and 26 (18.2%) top-graded central bankers in the low transparency group and 126 observations and 27 (21.4%) superstar central bankers in the high transparency group.

We then re-do the analysis of Section 5 separately on each subsample. By re-matching within each transparency category, we ensure that central bankers in a well (poor) defined transparency framework can only match their peers in high (low) transparency regimes. Thus, the resulting differences in outcomes across the treated and control sample can be interpreted as the effect of the award within economies of that transparency type and are distinct from any direct effect of transparency on the outcome in question. Because changes in the index following awards might confound this interpretation, we verify that winning an award does not significantly predict changes in the transparency regime at the end of the award year and the end of the subsequent year.¹⁵

¹⁵The p-values of the award winning dummy in these auxiliary regression are 0.263 and 0.612, respectively.

The results are presented in Table 4. On average, superstar central bankers in low transparency regimes yield lower (expected) inflation rates and central bank rates than their non-award winning counterparts while there is no significant effect on output (expectations). In contrast, superstar central bankers in high transparency regimes lead to higher expected RGDP growth rates without negative consequences for inflation (expectations).

One interpretation of these findings is that top-graded central bankers in "weak" institutions perform better in bringing inflation (expectations) under control, i.e., they try to improve the output-inflation trade-off, whereas the superstars in well defined transparency regimes can use their discretion to exploit an already more favorable output-inflation trade-off and boost expected real GDP without negative consequence for inflation (expectations).

6.3 Pre-crisis versus financial crisis

Our analysis is inspired by the fact that central bank governors have moved center stage ever since the outbreak of the recent financial crisis. Therefore, one obvious robustness test is to examine the financial crisis years in our sample (2008-2011) and the pre-crisis years (2001-2007) separately. We re-do the analysis of Section 5 separately for both subsamples when assigning the nearest neighbor to the 37 top-graded central bankers in the pre-crisis subsample and the 16 superstars in the financial crisis period.

Table 5 shows the results. When focusing on the pre-crisis period, top-graded central bankers make a statistically significant difference in terms of lower inflation at the end of the award year. Thus, this finding is even stronger compared to Table 2 where the difference was "close" to being significant. Similarly to Table 2, we find a positive and significant effect on (expected) real GDP growth. During the crisis period, however, we observe an even stronger influence of superstars on output as the treatment effect is three times higher (i) at the end of the next year in case of actual GDP growth and (ii) at the of the award year in case of expected GDP growth.

These results suggest that economies led by a superstar central banker experience a boost in confidence as the effect of top-graded central bankers on output growth is much stronger during the second subsample. During the turbulent economic and financial crisis, a superstar central banker helps restoring confidence in the economy and leads to a massive increase in (expected) growth. However, one negative

consequence during the crisis period is that boosting the economy has a negative side-effect in terms of a significantly higher expected inflation gap.

6.4 Impact of superstars beyond tenure

As mentioned before, one problem associated with our procedure is that some of the top-rated central bankers and some of the nearest neighbors retire during the year after the award was handed out. So far, we dropped these observations for the calculation of treatment effects for the year $t + 1$. However, it can be argued that due to the considerable outside lag of monetary policy central bankers might have an impact on the economy even after they have left office.

Table 6 shows the results where we compare the influence of superstar central bankers with their peers during the year $t + 1$ even if they have left office before (right panel). The results are a bit weaker than in Table 2 as only the coefficient for expected RGDP growth is significant. This indicates that the more favorable output-inflation trade-off is directly linked to the personality of the superstar central bankers and less so to the economy in which the superstar central banker works.

7 Concluding remarks

Recently, ECB president Mario Draghi (2013) argued: "there was a time, not too long ago, when central banking was considered to be a rather boring and unexciting occupation." He continued by saying: "some thought that monetary policy could effectively be placed on auto-pilot". The financial crisis and the subsequent recession changed this. Not only became central banking more important than ever before, but also the personalities involved in the making of monetary policy entered the spotlight. Central bankers turned from technocrats into charismatic public figures.

This paper showed that the hopes the press and the public attach to top central bankers are, at least partly, justified. Central bankers receiving the top grade by the financial press, our empirical proxy for a superstar status, deliver significantly higher rates of (expected) real growth in the absence of additional inflation (expectations). Thus, they face a more favorable output-inflation trade-off than other central bankers. The nearest neighbor matching approach isolates the effect of the superstar status by appropriately controlling for the endogenous nature of the school grade.

We also show that the more favorable output-inflation trade-off is directly linked to the personality of the superstar central bankers and less so to the economy in

which the superstar central banker works. An examination of low and high central bank transparency regimes reveals that superstars in "weak" institutions perform better in bringing inflation (expectations) under control, i.e., they try to improve the output-inflation trade-off, whereas the top-graded central bankers in well defined transparency regimes can use their discretion to exploit an already more favorable output-inflation trade-off and boost expected real GDP without negative consequence for inflation (expectations). Finally, we identify a "boost in confidence" as one of the reasons why a superstar has an influence on (expected) real output growth. If one is willing to interpret becoming a superstar central banker as building a reputation, the results presented in this paper could also be seen through the lens of the signaling or reputation-building literature.¹⁶ Although signaling in the theoretical literature is narrowly defined as being tough on inflation in order to transmit information to the public, receiving a top grade also reveals information that helps improving the output-inflation trade-off.

As forward guidance becomes a widely used tool for more and more central banks facing the zero lower bound on nominal interest rates, competition among countries for top central bankers will intensify further. It is fair to bet that the case of headhunting Mark Carney might only be the beginning.

¹⁶See Backus and Driffill (1985a) and Backus and Driffill (1985b) for the classic contribution and Hansen and McMahon (2013) for a recent empirical implementation signaling in monetary policy.

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Figures

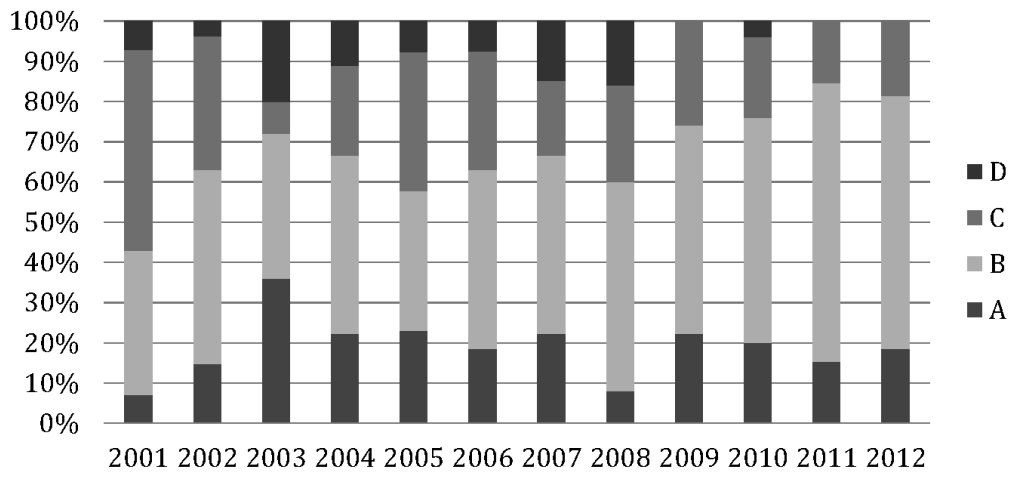


Figure 1: Distribution of grades over time

Year t		Year $t+1$		Year $t+2$
Early-Year	Mid-Year	Early-Year	Mid-Year	Early-Year
Information for Year $t-1$ becomes available and is used for Probit Estimat. in Year t	Grades for Year t	Information for Year t becomes available and is used for Treatment Effects in Year t	Grades for Year $t+1$	Information for Year $t+1$ becomes available and is used for Treatment Effects in Year $t+1$

Figure 2: Timing of grades and information sets

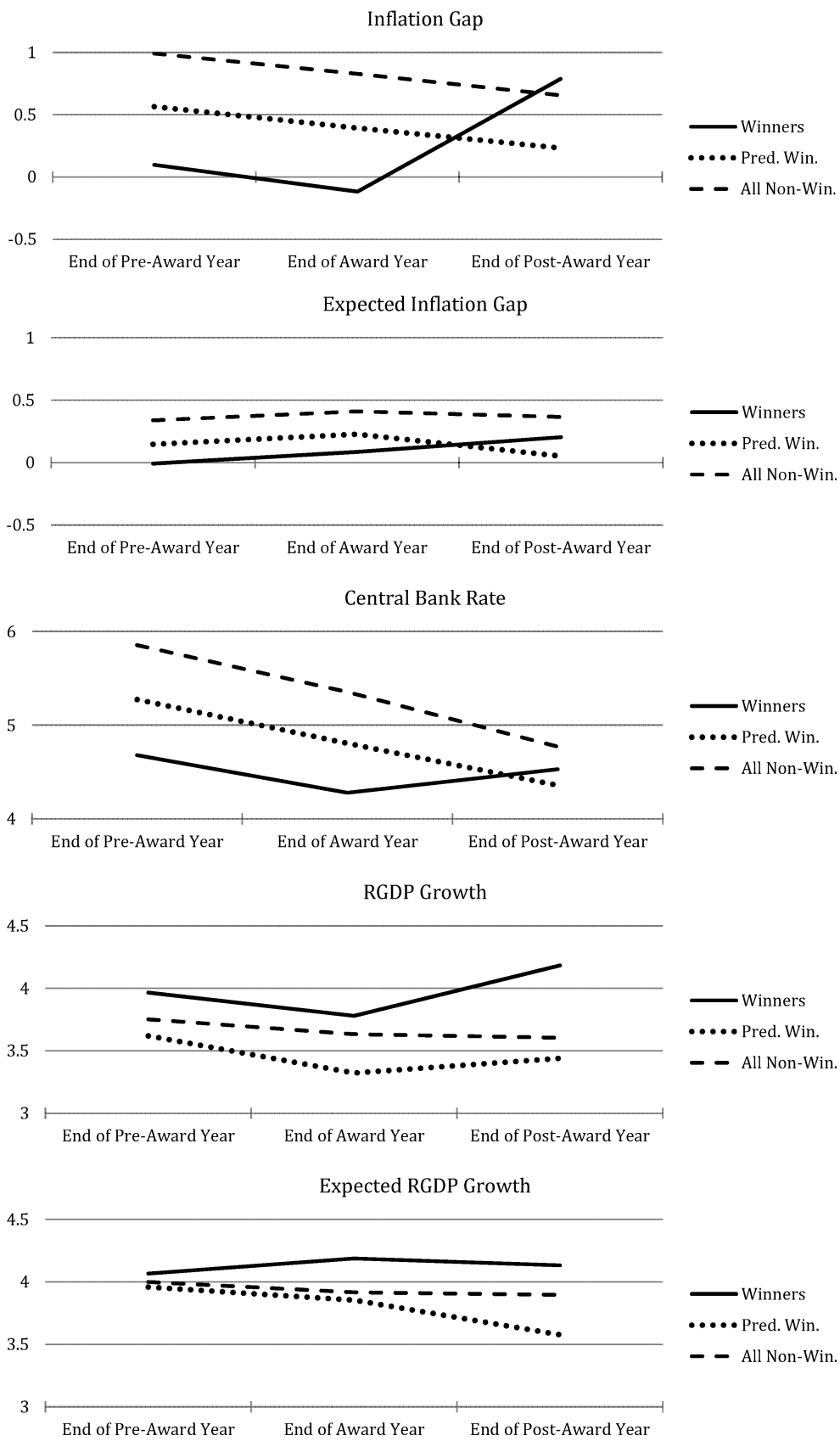


Figure 3: Performance of winners, predicted winners, and all non-winners

Tables

Table 1: Explaining central bankers' status

	Coefficients	Prob (Grade = A)
Big 10	0.449	0.074
Transparency	0.223	0.037
Transparency ²	-0.010	-0.002
Years in Office	0.443**	0.073**
Years in Office ²	-0.025**	-0.004**
Female	1.730**	0.285**
Jackson Hole	0.760	0.125
Inflation Gap > 0	-0.010	-0.002
Inflation Gap < 0	0.137	0.023
Expected Inflation Gap > 0	-0.848*	-0.140*
Expected Inflation Gap < 0	-0.083	-0.014
Central Bank Rate	0.056	0.009
RGDP Growth	0.152*	0.025*
Expected RGDP Growth	0.080	0.013
Deviation from Taylor Rule > 0	-0.092	-0.015
Deviation from Taylor Rule < 0	-0.100**	-0.016**
Stock Returns	0.002	0.000
Credit/GDP	3.120*	0.514*
(Credit/GDP) ²	-2.314**	-0.381**
IT	0.340	0.056
Floating FX Rate	1.171**	0.193**
Currency Crisis	-0.173	-0.028
Constant Term	-5.979**	
Observations	269	
LR Statistic	100.6**	
Pseudo Log-L	-78.9	
Pseudo R ²	0.409	

Notes: Results of probit estimation of Equation (1). Model includes year-fixed effects (not shown). Middle column shows the coefficients and right column the average marginal effects. A significance level of 1%, 5%, and 10% is indicated by **, *, and (*), respectively. Huber (1967)/White (1980) robust standard errors are used.

Table 2: Superstar central bankers and subsequent macroeconomic performance

	End of Award Year	End of Next Year
Inflation Gap	-0.511	0.554
Expected Inflation Gap	-0.142	0.152
Central Bank Rate	-0.527	0.172
RGDP Growth	0.457	0.743 (*)
Expected RGDP Growth	0.334 *	0.555 **
Observations	269	229

Notes: Results of Abadie-Imbens (2006, 2011) estimation of average treatment effects on the treated. A significance level of 1%, 5%, and 10% is indicated by **, *, and (*), respectively. Abadie-Imbens (2012) robust standard errors are used.

Table 3: Explaining central bankers' status: Robustness test using ordered probit

	Coefficients
Big 10	0.324
Transparency	0.044
Transparency ²	-0.009
Years in Office	0.221**
Years in Office ²	-0.014**
Female	1.060**
Jackson Hole	0.266
Inflation Gap > 0	0.070
Inflation Gap < 0	0.122
Expected Inflation Gap > 0	-0.442**
Expected Inflation Gap < 0	-0.204
Central Bank Rate	0.017
RGDP Growth	0.093*
Expected RGDP Growth	-0.173
Deviation from Taylor Rule > 0	-0.020
Deviation from Taylor Rule < 0	-0.011
Stock Returns	0.001
Credit/GDP	1.678**
(Credit/GDP) ²	-1.065**
IT	0.598**
Floating FX Rate	0.491*
Currency Crisis	0.091
1st Cut Point	-0.483
2nd Cut Point	0.663
3rd Cut Point	2.223*
Observations	269
LR Statistic	123.7**
Pseudo Log-L	-281.4
Pseudo R ²	0.172

Notes: Results of ordered probit estimation of Equation (1). Marginal effects (not shown) are available on request. Model includes year-fixed effects (not shown). A significance level of 1%, 5%, and 10% is indicated by **, *, and (*), respectively. Huber (1967)/White (1980) robust standard errors are used.

Table 4: Superstar central bankers and subsequent macroeconomic performance: Low transparency versus high transparency

Low Transparency	End of Award Year	End of Next Year
Inflation Gap	-1.509 *	0.200
Expected Inflation Gap	-0.559 (*)	-0.333
Central Bank Rate	-2.423 *	-1.023
RGDP Growth	0.768	0.387
Expected RGDP Growth	0.373	0.087
Observations	143	120

High Transparency	End of Award Year	End of Next Year
Inflation Gap	-0.696	-0.029
Expected Inflation Gap	0.051	0.024
Central Bank Rate	0.373	0.512
RGDP Growth	0.173	0.831
Expected RGDP Growth	0.376 (*)	0.502 (*)
Observations	126	109

Notes: Results of Abadie-Imbens (2006, 2011) estimation of average treatment effects on the treated. A significance level of 1%, 5%, and 10% is indicated by **, *, and (*), respectively. Abadie-Imbens (2012) robust standard errors are used.

Table 5: Superstar central bankers and subsequent macroeconomic performance: Pre-crisis versus financial crisis

Pre-Crisis (2001-2007)	End of Award Year	End of Next Year
Inflation Gap	-0.759 (*)	0.905
Expected Inflation Gap	-0.249	0.072
Central Bank Rate	-0.408	0.840
RGDP Growth	0.903 *	1.044 **
Expected RGDP Growth	0.280	0.551 *
Observations	181	152

Crisis (2008-2011)	End of Award Year	End of Next Year
Inflation Gap	-0.218	0.509
Expected Inflation Gap	0.267 (*)	0.203
Central Bank Rate	-0.559	0.739
RGDP Growth	-0.245	3.187 **
Expected RGDP Growth	0.927 **	0.444
Observations	88	77

Notes: Results of Abadie-Imbens (2006, 2011) estimation of average treatment effects on the treated. A significance level of 1%, 5%, and 10% is indicated by **, *, and (*), respectively. Abadie-Imbens (2012) robust standard errors are used.

Table 6: Superstar central bankers and subsequent macroeconomic performance: Robustness test with impact beyond tenure

	End of Next Year	... Impact Beyond Tenure
Inflation Gap	0.554	0.155
Expected Inflation Gap	0.152	0.570
Central Bank Rate	0.172	0.129
RGDP Growth	0.743 (*)	0.202
Expected RGDP Growth	0.555 **	0.333 (*)
Observations	229	269

Notes: Results of Abadie-Imbens (2006, 2011) estimation of average treatment effects on the treated. Column 'End of Next Year' shows estimates from Table 2 for a convenient comparison. A significance level of 1%, 5%, and 10% is indicated by **, *, and (*), respectively. Abadie-Imbens (2012) robust standard errors are used.

Appendix

Table A1: List of central bank governors in the sample

ARG	Maccarone (01); Pignanelli (02); Gay (03-04); Redrado (05-09); del Pont (10-12)
AUS	Macfarlane (01-05); Stevens (06-12)
BRA	Fraga (01-02); Meirelles (03-10); Tombini (11-12)
CAN	Dodge (01-07); Carney (08-12)
CHI	Massad (01-02); Corbo (03-07); de Gregorio (08-11); Vergara (12)
CHN	Xianglong (01-02); Xiaochuan (03-12)
CZE	Tuma (01-09); Singer (10-12)
ECB	Duisenberg (01-03); Trichet (04-11); Draghi (12)
HUN	Jarai (01-06); Simor (07-12)
IDN	Sabirin (01-02); Abdullah (03-07); Boediono (08); Nasution (09-12)
IND	Jalan (01-03); Reddy (04-07); Subbarao (08-12)
ISR	Klein (01-04); Fischer (05-12)
JAP	Hayami (01-02); Fukui (03-07); Shirakawa (08-12)
KOR	Chon (01); Seung (02-05); Lee (06-09); Soo (10-12)
MEX	Martinez (01-09); Carstens (10-12)
MYS	Aziz (01-12)
NOR	Gjedrem (01-10); Olsen (11-12)
NZ	Brash (01); Bollard (02-12)
PHI	Buenaventura (01-04); Tetangco Jr. (05-12)
POL	Balcerowicz (01-06); Skrzypek (07-09); Belka (10-12)
RUS	Gerashchenko (01); Ignatiev (02-12)
SIN	Loong (01-03); Tong (04-05); Keat (06-10); Menon (11-12)
SUI	Roth (01-09); Hildebrand (10-11); Jordan (12)
SWE	Backstrom (01-02); Heikensten (03-05); Ingves (06-12)
THA	Devakula (01-06); Watanagase (07-10); Trairatvorakul (11-12)
TUR	Serdengecti (01-05); Yilmaz (06-10); Basci (11-12)
UK	George (01-02); King (03-12)
US	Greenspan (01-05); Bernanke (06-12)
ZAF	Mboweni (01-09); Marcus (10-12)

Table A2: Grades of central bankers

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
ARG	D		D	D	D	D	D	D	C	D	D	D
AUS	A	A	A	A	A		B	B	A	A	A	A
BRA	C	C	B	B	B	B+	B	B+	B+	B+	B+	B
CAN	B	B	D	C+	C	C	C	C	B	B+	B	A
CHI	A	B		B+	A-	A-	B-	B-	B	B	B+	B+
CHN	B	C	B	C	C+	C+	C	B-	C	C	B	B-
CZE	C	B	B	C	C+	B-	B	B	A		B	B
ECB	C	C	D	C-	C	C	C+	C	A	A	B-	B-
HUN	D	C	B	D	D	D		B	B	C	C	C
IDN	C	B		A	C	B	A			D	B	B
IND	C	C	A	B	B+	B+	A		B	C	B-	C
ISR	C	C	B	B		B	A	B	A	A	A	A
JAP	D	D	B	B	B	C-	C		B-	C	C	C-
KOR	C	B	A	B	C	D	B	B	A		C	C
MEX	B	B	B	B-	B	B+	B+	B	B	B	B	B+
MYS	C	B	A	A	A	A	A	B	A	A	A	A
NOR	B	B	A	A	A	A	B	B	C-	B		B
NZ	B		C	B	B	B	D	D	C	B	B	B
PHI	B	A	A	B		A-	A	B	B	B	A	A
POL	C	B	A	B	C	B	D	D	B		B	B-
RUS	C	C	D	D	D	C	D	D	C-	B	B	B+
SIN	C	C	C		B	B+	B	A	B	B	B	B-
SUI	B	B	D	B	B-	B	B	C	B	B-	B-	
SWE	C	A	B	A	A	C	A	B	C-	B	B+	B
THA	B	B	A	C	B	C	B	C	C	B	B+	B+
TUR	C	B	B	B+	B+	B-	B	C	B	A		B
UK	B	A		C	C-	B-	D	D	B	B	B	B-
US	C	C	D	D	C-	C	C	C-	C	C	C	B
ZAF	B	B	A	A-	A	A	B	A	B	B	B	C

Notes: The missing observations correspond to those cases where a new governor has taken office and the time elapsed since inauguration is too short to reliably assess her/his performance, i.e., the Global Finance magazine acknowledges that it is "too early to say" something about the governor's performance.

Table A3: Variable description and data sources

Variable	Description	Source
Inflation Gap	Annual growth rate of consumer price index (CPI)	IMF
Inflation Expectations	Expected annual growth rate of CPI in next year	Consensus Economics
Central Bank Rate	End of year central bank target interest rate	IMF
RGDP Growth	Annual growth rate of real GDP	IMF
Expected RGDP Growth	Expected annual growth rate of real GDP in next year	Consensus Economics
Real Interest Rate	End of year real interest rate	World Bank
Stock Returns	Annual growth rate of MSCI equity index	Thomson Reuters Datastream
Credit/GDP	Domestic credit to private sector over GDP	World Bank
<i>Discrete variables</i>		
Transparency	Ranging from 0 to 15	Horvath and Vasko (2013)
Years in Office	Number of years in office	Central bank websites
<i>Indicator variables</i>		
Big 10	"Advanced" central banks	
Female	Female governors	Central bank websites
Jackson Hole	Governor invited to Jackson Hole Summit	Kansas City Fed website
IT	Inflation targeting (IT) countries	Roger (2009) and central bank websites
Floating FX Rate	Freely floating exchange rate regime	Ilzetski et al (2010)
Currency Crisis	Exchange rate devaluates by more than one standard deviation	Own calculations

Table A4: Descriptive statistics

	Grade A	Grades B - D
Observations	53	216
Big 10	0.34	0.34
Transparency	8.54	8.13
Years in Office	4.74	3.38
Female	0.15	0.04
Jackson Hole	0.09	0.03
Inflation Gap	0.10	0.99
Expected Inflation Gap	-0.01	0.34
Central Bank Rate	4.68	5.85
RGDP Growth	3.97	3.75
Expected RGDP Growth	4.07	4.00
Deviation from Taylor Rule	-0.88	-1.75
Stock Returns	10.46	12.47
Credit/GDP	0.90	0.94
IT	0.72	0.56
Floating FX Rate	0.28	0.16
Currency Crisis	0.04	0.08

Notes: There are only 269 observations since either (i) grades for some of the governors/years (see also Table A2) or (ii) observations for some of the explanatory variables are missing.

Table A5: Other estimation methods and variables considered

Central bank independence. We also considered including a variable measuring central bank independence in the regression analysis. However, the commonly used indicators by Klomp and de Haan (2009) and Dincer and Eichengreen (2013) are not available for all years in sample and all countries in the sample, respectively. The former is available until 2005 only and the latter is not available for Brazil and Switzerland. In addition, including either index and truncating the sample does not lead to significant results, even in a bivariate setup without any other explanatory variables.

Country-fixed effects. We also considered including country-fixed effects. Such a regression leads to highly insignificant estimates for all institutional variables, probably due to the fact that these rarely change during the sample period. Since the estimates of institutional variables are more interesting from an economic point of view we decided against inserting country-fixed effects.

Macroeconomic variables in first differences (rather than in levels). In addition to including macroeconomic variables in levels, we also considered employing first differences. However, preliminary estimations indicate that the level of these variables matters and not the change to the previous year.

Real GDP gap (instead of real GDP growth). The choice in favor of (expected) real GDP growth is motivated by the fact that most central banks focus on this variable rather than on GDP gap measures in their communications (Gerlach, 2007), probably due to the difficulty of measuring the latter in real time. Accordingly, we follow the recent Taylor rule literature (see, e.g., Gorter et al, 2008; Sturm and de Haan, 2011; Neuenkirch and Tillmann, 2014) and use GDP growth measures rather than GDP gap measures. A widely followed practice in the literature is to employ the Hodrick-Prescott (1997) filter to create GDP gap measures. However, this assumes perfect knowledge of all future GDP growth observations since it estimates trend GDP growth based on a two-sided filter.